JPRS-EST-90-015
28 AUGUST 1990

FOREIGN
BROADCAST
INFORMATION
SERVICE

JPRS Report

Science & Technology

Europe

Science & Technology
Europe

JPRS-EST-90-015 CONTENTS 28 AUGUST 1990

MICROELECTRONICS

SCIENCE & TECHNOLOGY POLICY

EAST EUROPE

COMPUTERS

ADVANCED MATERIALS

UK Firm Developes RK 20K Carbon Fiber

90AN0299 Toddington NEW MATERIALS INTERNATIONAL in English May 90 p 5

[Report: "New Process Cuts CF Costs by 25 Percent"]

[Text] RK Carbon, the UK-based carbon and oxidised-fibre specialist—in which Enimont, the EniChem/Montedison joint venture, has a 50-percent interest—has just started full-scale production of 23,000-filament-count carbon fibre. Compared to carbon fibres presently used for automotive applications, RK's new grade—known as RK 20K—offers cost savings of up to 25 percent, it is claimed.

Announcing the development, the company's chairman, Colin Hill, said: "Worldwide, carbon-fibre users are now experiencing long delivery dates and high prices. New demand is overtaking current global manufacturing capacity. The fundamental problem facing producers of carbon fibre is not capacity, however; it is lack of availability of textile precursor of the necessary specification."

"For a number of years RK Carbon's research effort has concentrated on developing the process technology to allow us to produce commercial-grade carbon fibre from much lower priced, readily available acrylic tow. This frees us from dependence on the high-cost, specialised precursors conventionally used for carbon-fibre processing," he added.

RK began research into carbon fibres in the mid-1970's when its staff saw a gelling of interests from Rolls-Royce, Morgan Crucible and Courtaulds.

The company has three production lines, all with the capacity to make Panox, an oxidised acrylic precursor used in the manufacture of carbon-carbon brakes for aircraft such as the Boeing 747-400, Harrier AV8B, and the European Airbus.

The development of this technology coincides with additional manufacturing capacity which the firm has just brought on stream at the manufacturing complex at Muir of Ord, Scotland.

Added Colin Hill: "Our new 20K commercial-grade carbon fibre, together with parallel advances in composites manufacturing technology, greatly increases the viability of carbon composites for engine, drive train and suspension components, wheels, and structural assemblies. It gives woven cloths excellent drape characteristics, allowing complex mouldings, and it is, of course, ideal for honeycombe structures. In terms of performance, RK 20K is equivalent to conventional 6,000- and 12,000-filament count carbon fibre."

One of only two carbon fibre producers in the UK (the other is Courtaulds), RK Carbon's plant facilities represent approximately 20 percent of Europe's total installed carbon-fibre-manufacturing capacity. The company is also the world's largest manufacturer of oxidised PAN fibres, the uses of which include advanced carbon-carbon brake systems and fire-resistant-barrier fabrics.

Prior to the creation of the fourth line, RK's three lines have an installed capacity of 250 tons a year.

The fourth line will lift this to the 330-tons-a-year level.

Main outlets for the new fibre are as the basis for fire blocks in aircraft seating. They are now being used in other forms of transport where fire-protected seats are required.

As yet the application of carbon-carbon brakes in the automotive field is restricted to motor racing. The use in production vehicles is "small" but potentially large if cost/performance criteria can be met.

AEROSPACE, CIVIL AVIATION

European Southern Observatory's New Technology Telescope

90WS0012B Duesseldorf VDI NACHRICHTEN in German 9 Mar 90 p 37

[Article by Christof J. Hug-Fleck: "Sharp Look Into Space"]

[Text] After years of planning and development, the world's most modern telescope with 'active' optics—the NTT [New Technology Telescope]—has been officially commissioned in the main headquarters of ESO [European Southern Observatory] in Garching, near Munich. A highly efficient telescope is the vital element of all astronomical research. Consequently, scientists the world over strive to advance the technical performance of telescopes with ever more sophisticated systems to peer more sharply and ever deeper into space. During the past 30 years, however, there have been very few innovative ideas to point to.

To be sure, telescopes have become larger and perhaps even more efficient, but engineers and scientists know that the ponderous mirror, which is measured in tons, has about reached its technical limits with a diameter of five meters. The optical properties so desired by astronomers simply cannot be achieved when the diameter exceeds five meters. In addition, costs increase to the third power of mirror diameter, bursting through research budgetary limits.

Consequently, in 1982 the ESO member countries (Belgium, the Federal Republic of Germany, Denmark, France, Italy, the Netherlands,Th)TSweden, and Switzerland) decided to develop and build a new telescope-generation for their observatory situated on 2,400-m-high Mt. La Silla in Chile. By virtue of its technically manageable diameter, low cost, and highly advanced computer control system, the telescope was to achieve a considerably improved optical performance.

Under the direction of Prof. Massimo Tarenghi and Dr. Raymond Wilson the 'New Technology Telescope,' with its 3.58-m mirror diameter, was built in 1984-1989, and has now been put into operation with the scientists' greatest satisfaction. ESO's NTT is a telescope of the 21st century. Many newly developed optical, mechanical, and electronic technologies have massively enhanced the telescope's performance, as compared with conventional systems. The 'active' optics concept is the key to its success. In the production of the mirror, chief optics specialist Wilson permitted greater tolerances in form exactness, but insisted on a substantially improved surface quality.

Mirror Constantly Corrects Mirror Form

Instead of the usual 50^{-6} level tolerance in conventional mirrors, surface bumps could be reduced to one-fourth that value. This is comparable to 1-mm-high waves on a 300-m-large lake.

"Nonetheless, in order to bring the mirror to optically optimal form," Wilson explains, "the barely 24-cm-thick, 6-t glass ceramic mirror, made of 'zerodur,' rests on 3-fixed and 75-moveable stamps. These computer-controlled stamps press the somewhat moveable mirror once a second into the optically optimal form, thereby successfully compensating for tolerances as well gravitational and thermal deformations based on the position of the telescope." Moreover, in the near future even atmospheric distortions, which have set limits on ground-based sky observation, will be able to be compensated for to a great extent by so-called 'adaptive' optics. Computers analyze even tiny air movements and correct the mirror form by means of the 'active' optics so that the image can be projected almost without flickering. The results are convincing.

In March 1989, in the 'First Light' test run, NTT right from the beginning achieved a resolution of less than 0.2 arc seconds after the image had been processed by the computer. This is the best resolution ever achieved by a ground-based telescope and far surpassed the performance of the 1-m Keck telescope in Hawaii. The NTT image quality almost matches the expectations for the billion-dollar Hubble space telescope scheduled to be put into orbit in the spring of 1990, thereby freeing it of atmospheric disturbances.

By virtue of its elaborate measurement-and control-systems, the development of a new production process, and owing to its light construction and computer-controlled 'active' optics, NTT costs were minimized at 25 million DM. This figure is but a third of the amount needed 14 years ago for the construction of the same-sized (3.6-m) conventional ESO telescope in La Silla. Italy and Switzerland, with their ESO membership contributions, financed NTT.

Unprecedented sharp images from the most remote and faintest objects yield a more profound and more distinct look into the universe, suggesting new answers to basic astronomical questions like the big bang, the expansion of the universe, the origin of solar systems and galaxies, right up to an enhanced knowledge of elementary and gravitational particles.

From Chile to Garching Via Satellite

Pictures of the inauguration of the ESO Observatory, 12,000 km away in the Atacama desert in northern Chile, were transmitted via satellite to ESO headquarters in Garching. This served to demonstrate to the scientists gathered the highly efficient communications between the observatory and headquarters, communications that would permit the international scientific team to conduct research right out of Garching, without having to undertake the time-consuming trip to Chile.

By simply pressing a button, the Italian Research Minister Ruberti, the Swiss Ambassador Keusch, and the German Minister of Research Heinz Riesenhuber were able to steer the new telescope, thereby officially inaugurating it. Riesenhuber emphasized that "the successful completion of the NTT implemented revolutionary concepts in the technology of optical telescope, and impressively demonstrated the leading role of European astronomy in the world."

Matra To Build Hispasat Communications System

90AN0218 Paris ELECTRONIQUE HEBDO in French 1 Feb 90 p 2

[text] Matra has been selected to supply the satellite communications system Hispasat. The contract, worth more than Fr 1 billion, covers the construction of two satellites and their control and operational centers. The Spanish Government's decision to choose Matra was the result of an international call for bids to which Hughes, RCA/GE, and MBB responded. Matra Espace is thus strengthened in its position as leader of the European satellites sector. This contract also confirms the success of the Eurostar[1] platform, already selected by the international organizations Inmarsat and Locstar and by the French Government for its Telecom 2 program.

The first satellite will be launched during the second quarter of 1992; the second satellite's launch is planned for the third quarter of 1992. The Spanish aerospace industry will provide 30 percent of the complete system.

Footnotes

1. Eurostar: family of telecommunications satellite platforms jointly designed and developed by Matra and its partner, British Aerospace.

FRG-USSR Space Research Agreement Outlined

90MI0217 Bonn WISSENSCHAFT, WIRTSCHAFT, POLITIK in German No 13, 28 Mar 90 p 5

[Text] The agreement on an eight-day spaceflight for a German astronaut aboard the Soviet space station MIR in 1992 is ready for signing, the German Aerospace Research institute (DLR) announced last week. The

Federal Ministry of Research and Technology had delegated responsibility for the negotiations on the project to the DLR in 1989.

The DLR has negotiated the scientific payload with the Soviet organizations LICENSINTORING and TECHNOUNION. Under the agreement the German astronaut's "luggage" will consist of a 100 kg payload. Seven German experiments are scheduled, the option to update and improve the set-up of the individual experiments remaining open. The DLR itself plans for the Institute of Flight Medicine and the Institute of Space Simulation to contribute experiments of their own.

The former addresses aspects of materials science (supercooling of metals in an amorphous matrix), and the latter involves dosimetry and the biological sciences (issues such as the adaptation of the circulation and biorhythms to microgravity will be studied). As far as the precise definition of the scientific topics is concerned, the DLR states that there is room for adjustment here, too.

The list of experiments contributed by various universities and hospitals and the Max Planck Institute of Psychiatry in Munich in addition to the DLR must therefore be regarded as provisional.

The DLR has maintained contacts with Soviet scientists for several years. The DLR Institute of Flight Medicine, for example, has been holding informal talks with the Soviet Institute for Biomedical Problems since 1973. Several DLR experiments were carried out on board Soviet Biokosmos satellites in 1987 and 1989 under an agreement between the ESA [European Space Agency] and the USSR. A few days ago the DLR and the Soviet institute concluded a cooperation agreement that envisages cooperation in the following areas: space physiology and medicine, space biology, and radiation biology and dosimetry. Exchanges of scientists and joint studies on earth and in space are planned. The Institute of Space Simulation also aspires to longer-term cooperation with the USSR. In addition, DLR participation in the Soviet Mars-94 project is currently under consideration. It would take the form of a multispectral stereocamera that would fly on a Soviet Mars probe to a neighboring planet.

FRG: Dornier Tests New Fiber-Reinforced Ceramics

90MI0227 Friedrichshafen DORNIER POST in English No 1, 1990 pp 50-51

[Article by Dr. Tilman Haug, Dipl.-Ing.(FH) Ursula Ehrmann, and Dr. Rolf Ostertag: "Fibre-Reinforced Ceramics for Structures That Are Subject to High Thermomechanical Loads"]

[Text] High-temperature resistant materials are the prerequisite for many tasks in the aviation, space, and defences fields. Certain structural parts of space gliders or hypersonic aircraft, for example, must withstand temperatures of more than 1200°C in oxidizing or reducing (propulsions) atmospheres. Only ceramic materials are suitable for such tasks. The specific drawback of ceramics, their brittleness, can be limited by reinforcing them with continuous fibres to achieve a satisfactory damage tolerance. This new type of materials is still at the beginning of its career although some applications have already been implemented. Intensive comparative studies of different production technologies at Dornier showed that the combination of continuous fibres and a matrix of pyrolized organic Si polymers may yield the best economic and technical potential.

The developments in the space and aviation fields aiming at weight-saving designs, a better use of energy, longer operating lifetimes, and the planned use of the hypersonic range for future aircraft have led to component specifications which by far exceed the possibilities of conventional materials. Especially primary structures on the outside of hypersonic aircraft or space gliders are subject to high thermal and mechanical loads. Only ceramic materials can guarantee sufficient strength at temperatures of more than 1200°C and can resist to oxidation by atmospheric oxygen. Ceramic materials, as a rule, also have a weight advantage over metals, but their brittleness, which may lead to catastrophic failure, makes them unsuitable for use in airborne systems. Therefore, about 15 years of effort has been invested (by SEP, France) to obtain a sufficient damage tolerance of the material by combining continuous fibres and a ceramic matrix.

Presentation of Damage Tolerance

The CFC (carbonfibre-reinforced ceramics) material was proven to be damage tolerant in a non-oxidizing atmosphere. When compared with non-reinforced brittle materials, additional energy absorbing mechanisms become effective. Besides the activation of additional crack systems depending on the fibre layers, it is above all the delamination and the friction when fibres are pulled out of the matrix, combined with the possibility of load transfer over long ranges, that leads to a quasi-plastical material behaviour. Excessive tension thus does not lead to catastrophic failure but can be coped with locally. The load-elongation curve thus clearly differs from that of non-reinforced ceramics and resembles more that of metals. The defined failure behaviour while maintaining a residual strength allows to use fibre-reinforced ceramic components for primary structures as well.

So far, oxidation-resistant composite ceramics are predominantly made by preparing the ceramic matrix from the gaseous phase (Chemical Vapour Infiltration, CVI). In this way, the French company SEP has manufactured big structural parts of silicon carbide (SiC) reinforced by C or SiC fibres (C-SiC or SiC-SiC). This procedure requires very long process times, however.

New Infiltration Procedures

In the past five years, increasing efforts have become obvious internationally that aim at developing more

economic procedures for the production of more efficient structures of ceramics with continuous-fibre reinforcement. Dornier has studied the following promising technologies:

- CVI (p, T-gradient process) C-SiC, SiC-SiC
- pyrolysis of organic Si polymers C-SiC, SiC-SiC
- pressure-infiltration of ultrafine powders Al_2O_3-Al_2O_3

These processes differ by the aggregate states and the processing technologies for the materials employed. In the CVI process, a ceramic product is deposited in the voids of a preformed fibre prepreg by the reaction of process gases. A pressure and temperature gradient is used to considerably shorten the process time.

The use of liquid organic Si polymers opens up further possibilities for impregnating fibre bodies or for producing layups consisting of parallel fibre layers. In this field of work, the Dornier experience with fibre-reinforced plastics is put to use. Fibre layups impregnated with polymer are laminated, and these laminates will be cured under high pressure (approx. 15 bar) and temperature (approx. 200 to 400°C). The Si polymer is converted into a ceramic material without pressure at 800 to 1200°C. In this field, Dornier co-operates closely with Wacker Chemie who develops suitable Si polymers specially for this purpose.

With the pyrolysis of Si polymers, Dornier has already succeeded to make tiles of 25 by 25 cm and big thin-walled pipes. The special advantage of the laminating technology becomes obvious when making complete parts and fasteners. The manufacturing process here closely resembles that of plastic processing.

Pressure infiltration with ultrafine powders works with solid materials in suspension, called slip. Ultrafine powders (with a grain size of less than 1 micrometer) are produced by means of the reaction-spray process (RSV). Other than in the two procedures mentioned above, oxidic powders and fibres are used in this process. The slips are dehydrated together with the fibres under pressure, and the composite is subsequently hardened while pressure and temperature are increased.

After intensive studies and experimental work since early 1986, clear advantages have been recognized for the pyrolysis of organic Si polymers for matrix production:

- damage-tolerant behaviour at 1.100°C with strengths of up to 400 MPa could be proven
- "scaling-up" is easily feasible with the production technologies available for fibre-reinforced plastics
- comparatively low production price. As the two other procedures offer no comparable technical and economic potential, work will concentrate on developing the pyrolysis of organic polymers. Studies for CVI technology are also continued as this technology is suitable for post-impregnation and improvement of the surface characteristics.

Besides continuous fibres in the form of filaments or fabrics, shortcut fibres are studied as reinforcement material. This requires, however, a completely different processing technology. Work is concentrated mainly on the production of homogeneous mixtures of short fibres, powder, and polymer. We have succeeded in developing a promising production procedure, and we have already manufactured ceramic tiles with short-fibre reinforcement.

Applications

According to international market studies, fibre-reinforced ceramics have very good development chances in the aerospace sector. Engines with increased thrust-to-weight ratio, for example, will require parts made of fibre-reinforced ceramics. Dornier is conducting promising studies of the use of fibre-reinforced ceramic heat shields of space transporters. Applications in turbine and vehicle engine construction are also under discussion.

The development of ceramic fibre composites is very important for Dornier's specific fields of activity as in this way a key position for the future can be occupied. At the same time, application possibilities in other fields can be pursued and put to use.

FRG Aerospace Institute Participates in BRITE/EURAM Program

90MI0216 Bonn WISSENSCHAFT, WIRTSCHAFT, POLITIK in German No 10, 7 Mar 90 p 7

[Text] How can the noise pollution caused by aircraft be reduced? How can fuel be saved to make air travel cheaper and more environment-friendly? These are just some of the many problems that the German Aerospace Research Institute (DLR) is studying as part of the wide-ranging EC BRITE/EURAM [Basic Research Industrial Technologies for Europe/European Research on Advanced Materials] research project. The EC program involves a large number of interdisciplinary research projects on manufacturing technologies and new materials. A key area in this respect is aviation research, which is divided into the subsidiary areas of aerodynamics, acoustics, and on-board systems. These EC-subsidized research initiatives are based on close cooperation among industry, major research institutes, and universities.

The EC has approved DLR projects for an approximate total of 70 million Deutsche marks [DM]. These include, for example, the separate ELFIN (European Laminar-Flow Investigation) project. The DLR's institutes of design aerodynamics, fluid mechanics theory, and experimental fluid mechanics are participating in this project. The entire ELFIN project absorbs about DM20 million in financing. Another 23 organizations are participating in the project in addition to the DLR. The objective of the wide-ranging studies is to learn more about laminar flow on swept-back wings for passenger aircraft. The DLR believes that the results of this research may well be

"of great significance," especially for the development of future versions of the Airbus. The ELFIN project is subdivided into several individual areas. Wind tunnel trials at Modane in France are the first item on the agenda. These will be complemented by theoretical model calculations on a high-performance computer. Real flight tests with a Fokker F-100 aircraft will complete the ELFIN project. For this laminar flight test, the research aircraft will have a "laminar glove" fitted on one of its wings and an experimental section with complex measuring sensors will also be installed on the wing. The reason behind this series of exhaustive tests is that the lower the wing section resistance, the lower the aircraft's fuel consumption.

Additional DLR research contributions to the BRITE/EURAM program include studies on helicopter rotor aerodynamics, aero-accoustics issues, and aspects of propulsion technology (propfan). One of the goals in this respect is noise reduction. The topics of thermal insulation layers for the engine area and studies of damage propagation in composite components are on the materials research agenda. These new materials may eventually contribute toward a reduction in the empty weight of aircraft and thus toward fuel savings.

Italian Companies Awarded ESA Microgravity Contracts

Officine Galileo

90MI0193A Rome SPAZIO INFORMAZIONI in Italian 4 Apr 90 p 5

[Text] Two sophisticated pieces of equipment developed by Officine Galileo (EFIM [Manufacturing Industry Holding and Financial Company]/FinBreda Group) were recently launched from the Esrange launching site at Kiruna (Sweden) aboard the MASER-4 (Material Science Experiment Rocket) sounding rocket that subjected the payload to approximately seven minutes of microgravity. The first piece of equipment consisted of a module designed to measure the interfacial tension between two immiscible liquids. This experiment—referred to as MITE (Measurement of Interfacial Tension Experiment)—was designed by the CNR's Institute of Applied Physical Chemistry of Materials (ICFAM) in Genoa and the Milan Polytechnic's Interdepartmental Consortium for Space Research (CIRS). Officine Galileo was awarded a European Space Agency (ESA) contract for the development of the entire module in the MITE project and for the optical diagnostics and the electronic control and monitoring systems in particular, while CISE contributed to the supply of the mechanical structure. The second piece of equipment involved an experiment designed to measure the "linear dichroism" induced by electrophoresis on DNA molecules. Officine Galileo developed the optical systems for this experiment.

Microgravity Advanced Research, Support Center

90MI0193B Rome SPAZIO INFORMAZIONI in Italian 11 Apr 90 p 4

[Text] The MARS (Microgravity Advanced Research and Support) Center—a joint venture set up by the University of Naples and Aeritalia—has recently been awarded a European Space Agency (ESA) contract for a feasibility study on the inclusion of a MARS Center data base in the ESA's Columbus Utilization Information System (CUIS). This data base contains accurate information on almost all the worldwide microgravity experiments carried out to date as well as projected experiments. The results of the feasibility study will be submitted to the ESA by the end of the year.

Meanwhile, the MARS Center is also engaged in some activities on behalf of the Italian Space Agency (ASI), including a feasibility study on the use of expert systems in microgravity. In addition, the ASI's board of directors has recently approved three other contracts: 1) a theoretical study as a forerunner to the BPDU (bubble, drop, and particle unit) experiment; 2) a study on the evolution of the telescience system for Teletexus sounding rockets; 3) an experiment on the growth of urea crystals (in cooperation with the MASPEC of the University of Parma).

Italy: Computer for Ulysses Interplanetary Probe Developed

90MI0198 Turin MEDIA DUEMILA in Italian Apr 90 pp 81-83

[Article by Massimo Bozzo: "Appointment With the Sun"]

[Excerpts] On 15 October the Ulysses interplanetary probe developed by the European Space Agency will depart on a four-year voyage that will carry it over the sun's south pole and one year later over its north pole. Ulysses has two unique characteristics with respect to all other interplanetary probes launched to date. It will be the first vehicle constructed by man to fly over the poles of the sun and therefore leave the so-called ecliptic plane, that is, the plane on which all the planets orbit. To do this, the probe will resort to a particular celestial mechanics trick that will provide it with the required thrust for the long voyage and that would be impossible to transmit at takeoff. Brought into the earth's orbit by the American space shuttle Atlantis, Ulysses will receive the thrust from an American-produced inertial upper stage (IUS) rocket engine and will head toward Jupiter, the largest planet in the solar system, which at that moment will be located directly opposite the sun. Reaching Jupiter after 15 months, the probe will be captured by its gravitational force that will have a catapult effect and divert its trajectory downward in the direction of the sun.

During the entire voyage, Ulysses will be monitored from earth, but all the on-board equipment will be

operated by a computer produced in Italy by Laben. The same company produced the computer for the Giotto probe that came close to Halley's comet. An "intelligent" computer is, in fact, indispensable for controlling a probe that is millions of kilometers from earth. Even if radio waves travel at the speed of light (300 thousand km per second), hours can pass between the sending of a signal indicating a possible breakdown on Ulysses and the arrival of a corrective signal from earth. Among the twelve principal experiments on board is an experiment on gravitational waves devised by an Italian, Professor Bertotti of the University of Pavia.

[Passage omitted] The construction of Ulysses was headed by the FRG's Dornier. Italy's Laben was assigned the development of the most important piece of the probe, its data processing "brain." The device is distinguished by the initials OBDH (on-board data handling), that is, the management of on-board data to control all the parts of the cosmic vehicle, and the management of all experiments and communications with earth stations. This machine, therefore, is responsible for the successful outcome of the undertaking. If something in this sophisticated "brain" should malfunction, the entire mission would be compromised.

This main computer consists of four parts: the decoder command unit that receives and translates signals coming from earth and distributes them to various instruments; the central terminal unit, the real heart of the system, composed of a computer that carries out an autonomous dialog with the various elements of the probe, directing them with a series of questions and answers according to the tasks to be completed; remote terminal units composed of peripheral computers that receive commands from the main computer and generate orders directed to the outlying equipment; and mass memories composed of a pair of tape recorders produced by the American company Lockheed according to Laben specifications.

The tasks of the brain developed in Italy are: The distribution of commands received from earth or generated by the computer itself, based on information acquired by the probe; the acquisition, management, and handling of scientific data produced by the on-board instruments; autonomous control of the probe's operations when contact with the earth is not possible; and the generation of reference time to analyze the probe's pace during the five-year mission. The Italian contribution to the probe's development is completed by the trim sensors constructed by Galileo and the electrical supply equipment produced by Fiar.

A security feature of the Laben computer is its ability to tolerate a certain number of anomalies or breakdowns during the mission without compromising the scientific observations being carried out. In the event that contact is lost with the earth stations, the computer begins a dialog with the probe's attitude control system, which consists of sensors that observe the stars and small propellors for the vehicle's movements, and brings Ulysses back into the correct position. A similar computerized system produced by Laben was on the Giotto probe that crossed the tail of Halley's comet in March 1986. On that occasion, just as had been predicted, the impact with the particles of the comet unbalanced the probe, which lost contact with earth because its antenna was no longer in the correct position. After exiting the commet's coma, the automatic system intervened and reestablished contact with the mission control center in Darmstadt. Thanks to this, Giotto will now be used for a second exploration.

AUTOMOTIVE INDUSTRY

Renault, Volvo Sign Cooperation Agreements

90WS0012A Duesseldorf VDI NACHRICHTEN in German 9 Mar 90 p 13

[Article by Veronika Hass: "Attack Is the Best Defense"]

[Text] The exchange of stock shares between Volvo and Renault has now enriched the international automobile industry with a new assembly facility. According to Renault-President Raymond Levy, the underlying reason for the cooperation agreements, by which the two enterprises have become the fourth largest industrial conglomerate in all of Europe, is that "you cant survive without trying to reduce the number of automobile producers in the market somewhat."

With 12.5 percent of the European automobile market and a total production of 2.3 million units, the two companies have now reached "critical mass," which should guarantee their survival in the face of ever sharper competition. In the production of trucks exceeding 15 t, the two enterprises will become number one in the world market, but will remain in third place behind GM Isuzu and Mercedes in the overall truck field. "The Europeans have had to band together to avoid turning everything over to the Japanese and becoming Nippon's 'aircraft carrier,'" Levy emphasized. "To be sure," he added, "a new cooperation would have developed even without the Japanese pressure." For Roger Fauroux, French Minister of Industry, on the other hand, the 'threat' from the Far East was the 'cement' for joining the two groups—the best defense is still to be stronger than the attacker.

The two companies worked together earlier from 1979 to 1985 during Renault's participation in Volvo Car. But they separated five years ago, without further projects having materialized. Nor will these agreements necessarily lead automatically to a 'marriage' of the two industrial groups, as Fauroux argues hopefully, even though the agreements do not exclude such a partnership at some later time.

For now the two groups will be satisfied with a mutual share division of 45 percent in trucks and about 25 percent in automobiles. Specifically, Renault SA is to take over 10 percent of Volvo Holding, 25 percent of

Volvo Car, and 45 percent of Volvo Truck for 14 billion francs. In turn, Volvo is to obtain 20-25 percent of Renault SA and 45 percent of RVI [Renault Vehicules Industriels] for about 22 billion francs. Any further exchange of shares would only be considered if this cooperation yields positive results. Levy maintains that the first stage must now be to learn how to get along with each other. Initially, the agreement will be valid for ten years.

Otherwise Renault's president in no way distances himself from the marriage picture drawn by Minister of Industry Fauroux, the quasi guardian of the nationalized company. The contract takes into account the possibility of divorce, he says, but forbids infidelities. If one of the partners wants to undertake a share exchange with another enterprise, he can only do so with the approval of the existing partner. However, technical cooperation is possible with other enterprises.

The Swedish newspaper Goeteborg Posten, which was the first to report on the negotiations between Renault and Volvo last year, now reports that Volvo is also negotiating for cooperative projects with Chrysler and Mitsubishi (individual parts and autos for the American market). The Swedish enterprise reportedly will soon build autos for the Japanese company in its Belgian plant. To tighten the net still further, Chrysler holds 12 percent of Mitsubishi and already jointly produces autos with the Japanese enterprise in the USA. The first direct benefits for the two enterprises from the consolidation can be in R&D, in buying, and, in Levy's opinion, in all aspects not connected with sales. Volvo is the Renault importer for Sweden and will remain so; conversely, one can easily see that Renault will market Volvos in those markets where the French group is particularly strong. In the more distant future it is conceivable that one vehicle would be marketed under two different names and on two different markets. Obviously the two auto-producing giants have not yet revealed the entire scope of their agreement. The Paris newspaper La Tribune de l'Expansion reports, for example, that Renault and Volvo want to extend their 1988 26,800-unit lead in the production of trucks exceeding 15 t over Mercedes 81,152 units. A jointly produced truck is supposed to appear on the market in a few months. The agreements between Renault and Volvo have led to a run on the stock of competitor Peugeot, which is considered greatly undervalued, on the Paris stock market.

This, however, is not the only reason for the market activity. It is rumored in Paris that PSA, the parent company of Peugeot and Citroen, might now seek a closer cooperative undertaking with Fiat or Toyota. Nor can it be excluded that interested Japanese parties were also working behind the scenes during the most recent stock market movements. This would be particularly ironic since PSA president Jacques Calvet in the sharpest critic of Japanese business conduct (against which Europeans must defend themselves) in France. Renault Also Cooperates with Peugeot Peugeot and Renault, for their part, already cooperate in three common daughter companies: Chausson body production, Francaise de Mechanique engine production, and in automatic drives. Moreover, PSA cooperates with Fiat, and Fiat cooperates with Volkswagen (Audi, Seat). There are also ties between Japanese producers like Mitsubishi and Toyota, which have allied with Chrysler—which also cooperates with Renault—and General Motors. The linkups could be extended almost at will, and the degree of worldwide cooperation will also continue to increase. An example recently cited by Calvet sheds light on the underlying cause. Jacque Calvet recently estimated that, despite the good market conditions in recent years, the European market actually only grew by about 1 percent a year. If Japanese producers turn out roughly 1.5 million vehicles in European plants in the next ten years—a number that can be deduced from their investments so far—it would mean, on the basis of pure mathematics, the end for one of the six large European producers: Fiat, Volkswagen, PSA, Ford Europa, Opel-Vauxhall, or Renault. Now, by virtue of its cooperation with Volvo, Renault has moved closer to its goal on not being the sixth wheel on the European car.

BIOTECHNOLOGY

FRG Firm Builds Computer Factory in USSR

90WS0016B Munich HIGHTECH in German Apr 90 pp 102-103

[Article by Wolf-Ruediger Ussler: "Mentor for Moscow"]

[Text] A highly polished, solid desk top rests upon two black, squared ashlars. Diagonally across from this seat of power in the plush, large office of businessman Babeck Seroush, former U.S. President Ronald Reagan smiles out from a ornately framed portrait. Was he really the leading proponent of boundless free enterprise ?

The barely 1.60-m-high Seroush grins from behind his impressive managerial desk at the question. "No," he answers simply, "my wife lives in the States and occasionally sends me these ugly picture cards." With its Cocom attacks against the communist world, the Reagan administration had often thwarted Seroush's prospering businesses in the East.

As the business manager of IPS International Processing Systems GmbH in Cologne, which he founded in 1972, Serousch is an exceptional phenomenon on the German technology scene. What even the wealthiest concerns have so far been unable to do, this native Iranian, a rare mix of adventurer and imaginative entrepreneur, has been able to chalk up in his success account book: 12 joint ventures in the Soviet Union. No idea seems too risky for him not to bring to fruition. One example is the German supermarket, offering more than 2,000 items,

that just opened in Moscow a few weeks ago. An agricultural production center, gradually developing around the metropolis will supply fresh produce to customers with foreign currency.

The 44-year-old entrepreneur has now just realized his latest joint venture coup—the establishment of the first German-Soviet joint enterprise for the production of modern personal computers—in Charkov in the Ukraine. Under the name Intercomp, up to 100,000 computers a year will be turned out. Initially they are being produced in a rented 4,000-square-meter area in an electrical equipment and printed circuit board factory. A minimum of one-tenth of that number has been set as the production goal for 1990.

U.S., Keeper of the Cocom Grail, Permits Faster PCs To Go East

IBM-compatible machines with MS-DOS operating systems, translated into Russian by Ipan, appear in two models. Besides an XT-model, an AT- computer with a Type 286 Intel-processor are to speed up the sluggish Soviet bureaucracy. Delicate liberalization trends in the Cocom [Coordinating Committee for East-West Trade Policy] list, attributable to the political opening of the Soviet Union, have imparted an impetus to the sensitive electronic computer components business. The Cocom controls factory, with the United States as the supreme Keeper of the Grail, regulates the export of Western technologies to the East.

While the export of the 386 [as published] processors behind the melting iron curtain will still require approval in the future, commencing in January 1990, the 286 systems will be sold to the socialist world without any great formalities. Seroush, who is called Herr Babeck both here and there, still remembers the times before the present thaw between the two power blocs. When the U.S enterprise Digital Systems delivered drill presses for multilayered printed- circuit boards, those and other business relations were frozen in 1979, when Washington tightened the export regulations. "The Russians," Seroush explained, " always lifted their hands in despair whenever the conversation turned to American machines."

Now, with the loosened sanctions, things are easier. The lively Iranian will certainly benefit from his profound knowledge of the Soviet Union as well as from years of established relations. And, not least of all, his accent-free Russian helps to open all doors. He arrived in Stalin's Russia in the mid 1950s as a victim of political turmoil in Persia. He studied physics in Moscow and Cologne. Before he became an independent entrepreneur, he was active for German and Swiss companies, and soon earned a reputation among his Russian partners as a mentor in East-West business matters.

He laid the foundation stone for a German-Soviet joint enterprise for the production of computers in 1984, when close cooperation began between IPS in Cologne and the Moscow Academy of Sciences.

Professor Boris Naumov, the father of the Russian microcomputer, understood that the USSR urgently needed modern, Western state-of-the- art computers. As recently as five years ago, there were scarcely any examples of such minicomputers in the Soviet Union. "Up to that time, the Russians had foolishly built only large computers," Seroush recalls.

That changed in 1985, when the State Committee for Computer Science was established. But the crafty Persian was still not actively involved even then. Instead, a Soviet domestic production facility was first conjured up. The overall quality of its machines, however, when measured against Western standards, was miserable. In addition, the Soviet system of favoritism created ridiculous prices. This ponderous State piece of machinery, which was put out as a full-bodied AT-model computer, cost as much as 200,000 DM.

Babeck's time only came in the summer of 1988, when the Intercomp joint venture, of which he was also managing director, was signed. IPS and the Russians participate on a 50/50-percent basis in this undertaking, whose common capital stock amounts to 600,000 DM. During the first phase, investments run to 3.5 million dollars. Babeck hopes to recover this rather substantial (by IPS standards) amount within a short time by selling the PCs in the USSR for mostly hard currencies—but in no way for nonconvertible rubles.

In contrast to the horrendous prices for the Russian State computers, the cost of the Intercomp computers are to be similar to those for comparable models in the West. According to Serousch, everything is to be produced in the USSR, although the components will come from the Far East and apparently all will be tested for 48 hours in a climatic chamber in the Federal Republic of Germany. Another partner, included not least of all because of its existing buying infrastructure, is Comtech Vertriebs GmbH of Essen. Comtech has also been designated to share responsibility for the development of the hardware.

IPS personnel have already scouted out the Federal Republic and Switzerland as a potential sales market for the computers presently being produced by the 80 workers in Charkov. But before any computers cross over the border, a second plant, called Infa, has been planned for this year in Archangel on the White Sea. This is to be the site particularly for the computers and software intended for the timber industry, which is concentrated there. Plans call for IPS to have a 20 percent share in this joint venture. The association of sawmills will hold three times this amount of shares. The remaining 20 percent will be divided between an IPS affiliate in Switzerland and various USSR institutions as, for example, the Foreign Trade Bank and the Ministry of Foreign Trade. Whether production will be underway in Archangel by 1990, remains to be seen. "Whoever invests in the USSR must be patient," IPS manager Herr Babeck councils. Yet, in the final analysis,

his own business ties have managed to survive even the hottest periods of the Cold War.

FRG: BMFT Subsidizes R&D on Renewable Raw Materials

90MI0215 Bonn WISSENSCHAFT, WIRTSCHAFT, POLITIK in German 18 Apr 90 p 11

[Text] The BMFT [FRG Ministry of Research and Technology] has been subsidizing the joint research project on polysaccharides in the renewable raw materials sector for two years. Under this project the cellulose and starch processing chemical industry and various university institutes are working together to make up the ground lost in decades of neglect of research on this topic. The program is currently funding 17 projects at 13 different universities and research institutes for a total of about 10 million Deutsche marks [DM]. The projects address problems relating to the analysis of polysaccharides and their derivatives and their isolation and formation of derivatives, focusing primarily on the issues of emission-free production and bleaching of cellulose and the search for nonpolluting, cost-effective derivative formation processes. A third priority topic is the production of new polymers using carbohydrates or carbohydrate components, where research work on developing polysaccharides, polyesters, and polyurethanes is in progress. Industry is scheduled to begin participating financially in various projects when the 100 percent BMFT-funded starting phase expires at the end of 1991.

Austrian Institute Plans Genetics Research Center

90WS0016A Munich HIGHTECH in German Apr 90 pp 54, 55

[Article by Harald Thurnher: "Mecca With the Vienna Effect"]

[Text] New methods of cancer treatment are eagerly being sought throughout the world. Notwithstanding these efforts, various therapies, which put the patient at great risk, must still be employed. These include the surgical removal of tumors as well as problematic radio- or chemical therapies. By virtue of the discovery and study of the so-called oncogene, and more recently of the recessive 'tumor suppressor gene,' the belief that probably all cancers are caused by changes in the genotype is gaining ground. The hour of the geneticists has now arrived. Their investigations are hoped to provide fundamentally new insights for the causal treatment of the cancer.

This background provided the impetus for one of the most remarkable international initiatives on the Austrian research scene in the recent past. Just two years ago the German pharmaceutical company Boehringer Ingelheim and San Francisco's biotechnical enterprise Genentech, which today leads the world, cemented their move into gene technology with a joint venture that is still unequalled in the pharmaceutical world today. The purpose of this research experiment is to uncouple fundamental research from applied, product-oriented research. By the year 2000, the two pharmaceutical giants hope to take stock of what their roughly 80 top scientists and 20 managers in administration and technology have achieved. Their hope today is for a miracle treatment for cancer and cash registers ringing in the profits.

But, now, at the onset of the 1990s, no one as yet knows exactly which genetic aspects play a role in the war against cancer. "By means of the development and use of totally new methods in molecular biology, we want to be able to identify the defective functions that make a malignant cell out of a healthy one," says Max Birnstiel, an internationally renowned scientist in the field, who is the director of the IMP [Research Institute for Molecular Pathology].

Progress in the Search for Causes

Meanwhile the experts in Vienna have made a small advance in their studies to engage cancer at its roots. It has been shown that more than a single defective gene is needed to transform a healthy cell into a malignant one. Birnstiel observes: "A chain reaction occurs when cancer develops. Like the avalanche effect, cascades of genes have to be activated for the cancer to develop." The so-called 'second messengers,' which function as a messenger system in the cytoplasma, play a decisive role in this process. During the process, large protein molecules settle—they are unable to penetrate the cell itself—in a specific recognition station (a membrane receptor) outside on the cell membrane. As a result of this 'docking' action, smaller messenger molecules are now activated inside the cell. They migrate directly into the nucleus, where they can switch genes on or off.

Cancer Cells Targeted for Destruction

Birnstiel provides details: "The membrane receptors can become damaged and cause massive disturbances in the second-messenger system, making it impossible to switch many genes off. Thus, a cell begins to proliferate blindly."

The researchers have to answer two decisive questions: Can the degeneration of the cells be reversed, so that they can function normally ? Or can the cancer cells at least be targeted for destruction, perhaps even to a certain extent with their own weapons? The Austrian Government too is greatly interested in the answer to these questions, and to date has granted the IMP about 20 million DM in subsidies. For the realization of the planned biological center, scheduled for opening in 1991 as an adjunct to the IMP, whose budget will be about 25 million DM yearly, also depends on the success of the Boehringer/Genentech joint venture. Besides the IMP, the Vienna University Institute for Biochemistry, Microbiology, and Genetics as well as Molecular Biology will be gathered together under one roof in this 'mecca of geneticists.' The purpose of this undertaking, namely, the spatial proximity of related institutes and the concentration of

the intellectual and material resources made available by industry and the universities, is plainly to reach critical mass in research.

Government Support

The close cooperation between economic and university research has already manifested itself in the care of students and IMP training programs. The large-scale research undertaking began with absolutely top molecular and cell biologists, whom Professor Birnstiel lured to Vienna from throughout the world.

And he had an easy job of it. The cultural metropolis Vienna (originally Heidelberg and Luxembourg had bid for to be the site for the IMP) exerted a strong attraction for the international research elite. In Vienna, the overstressed researchers could also find relaxation in the Viennese 'Heurige' [new wine festival) or in the variety of theaters and music performances. The English-speaking research elite refers to this today as the 'Vienna Effect.'

Another plus for the Vienna choice was that the Austrian Government provides support 'seed money' for particularly promising IMP projects within the framework of the biotechnology and gene technology emphasis program. Moreover, interesting projects are also eligible for support through Austrian grants for the furtherance of scientific research by the Academy of Sciences. The result of these common efforts is an impressive series of patents already in preparation.

COMPUTERS

European Large Parallel Processors Described

90AN0316 Edam SUPERCOMPUTER in English Mar 90 pp 18-28

[Article by Brian Oakley of Logica Cambridge Ltd, London: "The Challenge of the Large Parallel Processors in Europe"]

[Excerpts] For many years now the Cray Research machines have dominated the supercomputer market, because of their elegant pipeline architecture for handling vectors, but also because their overall components and design are as fast as the state-the-art will allow. Though multiple processor versions have been available, these are typically 2 to 8 processors. Gradually the number is increasing, with talk of the Cray-4 having 64 processors. But what is happening to the rising tide of competitive architectures? [passage omitted]

The Challenge to the Cray Supremacy

There would seem to be a variety of challenges to the Cray supremacy:

1. *The rival supercomputing firms, notably the Japanese:* These are not examined further here, though it will be interesting to see if the Japanese can create an overall technical lead. If they can, then the normal play of what Mrs. Thatcher would call "market forces" will eventually give them supply leadership—if free markets are permitted to arise! But I will say a word about the European scene.
2. *The massively parallel machines:* These are essentially machines like the DAP from AMT, and the Connection Machine from Thinking Machines. These are discussed in outline in the following sections.
3. *The so-called "minisupercomputers" of the Convex, Alliant, and Multiflow type.* These machines fill the gap between the large expensive supercomputers and the classical minicomputers or mainframes. Usually they have a vector processing facility. These are not considered here, except as a special case of the powerful workstation. But it is interesting to note that, last year, DEC, the world's second biggest computer manufacturer after IBM, announced their minisupercomputer.
4. *The powerful workstation, sometimes called the microsupercomputer:* Some speculation about the way the powerful single user workstation will eat into the supercomputer market is to be considered later. Of course there is no natural division between the minisupercomputer and powerful workstation, though it is tempting to see the presence of a vector processor as the distinguishing feature. Perhaps the real difference lies in the perception of the customer that the workstation is cheap enough to be a personal possession not to be shared with anyone.

The European Challenge

To describe the development of supercomputers in Europe as a challenge to Cray is, perhaps, a misuse of language. Nevertheless, there are several computer developments in Europe that deserve mention to an audience in Europe, if only because of the high quality of our academic, and even industrial, innovation in computer architectures. It is worth remembering that the DAP was the first massively parallel machine to come on to the market, and it is still the one with the largest market-share. And the transputer has revolutionized both the add-on accelerator market for PC's and the ease with which surfaces of parallel processors can be constructed. Both stem from the UK, even if the largest market for the DAP is now to be found in the USA, and the transputer is now owned by Thomson—a French company—after development by Inmos in the UK.

The main force for development of powerful computers in Europe stems from the EC Commission. They believe that the market for supercomputers in the 1990's will be large, with talk of $13 billion sales in 1990. The pressure from the US through its export control regulations to impose conditions on the location and use of US-made supercomputers when purchased for installation in Europe has upset several governments and bodies in Europe, most noticeably France and Germany. This has led to the thinking in some quarters that Europe must

have its own supercomputer industry, independent of the USA. And the trend to see general-purpose powerful machines to be used for both numeric and symbolic purposes has tapped a line of development that was originally largely aimed at the symbolic market through the "Fifth Generation" programs. It is interesting to note that no computer seems yet to have reached the market from the Japanese ICOT Fifth Generation research center, though of course they have from the earlier supercomputer program. The Supernode computer was part of the first European research program ESPRIT, in the same time scale, making use of the transputer. There are various machines on the market using transputers, notably the Meiko computing surface, which is selling well. But Supernode is the first fruit of a European multinational drive. It is now on sale from Parsys in the UK and Telemat Informatique in France. The concept stemmed from Royal Signal Research Establishment and Southampton University. It consists of a reconfigurable array of transputers, with each node containing 16 transputers providing 25 Mflop/s per node. Potentially there can be 64 nodes, providing a theoretical 1,500 Mflop/s or way into supercomputer performance, according to the U.S. Department of Commerce definition. But, perhaps, the interesting point is not so much its performance as its existence on the market. At the time of the ESPRIT conference in November 1989, over 50 systems were in use. Work is going on in ESPRIT II to provide improved systems, especially in software.

The Genesis high-performance numeric computer project under ESPRIT II was essentially a coming together of the Isis project in France, and the Suprenum project in Germany. So the main partners are Bull, Suprenum, Siemens, and GMD, with various other bodies in France, Germany, and the UK. It will use the next generation of transputers and will consist of a loosely coupled SIMD and MIMD architecture. There will be vector processing nodes, and, as usual with these types of construction, varying degrees of granularity in the parallelism to suit the specific problem's needs. Suprenum is already in use, though it has made little impact outside the German academic world. It will be interesting to see if Genesis can survive a not very promising start (Commission support has now been withdrawn).

The EDS European Declarative Architecture project has various origins, but one of the most important is ICL's Flagship project, which brought together ICL with Manchester University and Imperial College. This team has now linked with Bull and INRIA in France, and Siemens in Germany. Elsag and CSELT in Italy are also partners. So the three large computer firms of Europe, ICL, Bull and Siemens, who support the European Computer Industry Joint Research Centre in Munich, are partners in the project. EDS will involve a moderate degree of parallelism from 10 to 256 processors, say 100 to 2,500 Mips. So it will be capable of scaling over two orders of magnitude, and will provide parallel coprocessors for attachment to the mainframes of the three partners. It will support both declarative and symbolic languages, and probably its strength will come both from the range of products designed to a common architecture, and from the quality of the software work. The key problem with large parallelism is, of course, the problem of harnessing the processors effectively, and the related problem of making it easy for the user to create a program that readily maps on to the parallel configuration.

The third current "supercomputer" development in Europe to be supported under the ESPRIT program was Tropics, the Transparent Object-Orientated Parallel Information Computer System. This project was, in some ways, the most interesting of the developments, because it was specifically designed to handle object-orientated languages efficiently. Like the other projects, it envisaged parallelism ranging up to a few hundred processors with a message-passing architecture. The main partner was Philips, together with Thomson, Olivetti and Nixdorf. None of these developments in Europe can be seen as a major threat to the top-of-the-range Cray type monolithic, large memory, supercomputer market. But those that reach the market will serve specialist niche markets, and will certainly take some of the more specialized markets away from the true supercomputer vendors. The common factor that seems to link them is the use of less powerful individual components than those upon which Cray and the Japanese firms depend, but a use of parallelism up to, say, 256 processors, when the Cray company is moving only slowly towards 64 parallel processors. It is interesting to note that Jacques Sterne, until recently the chief executive of the Bull company, has recently formed a company to develop a supercomputer. It remains to be seen what will emerge, but a man of his experience would hardly do this unless he saw both the possibility of a technical breakthrough and a potential market.

The Massive Parallelism Challenge

The Digital Array Processor was first conceived by ICL's research team in the late 1960's and came on to the market in the late 1970's. It is now developed and marketed by AMT, Active Memory Technology, a British company—though its head office has recently moved to the USA—led by Geoff Manning, whom many of you will remember as the very forceful director of the RAL. In its normal form it contains 4,096 simple, one-bit processors. It is difficult to characterize the performance of such SIMD machines, since it is very dependent on the nature of the problem. But for the right type of bit-processing operation it can be extremely powerful, being capable of some 40 billion logical operations per second. A GaAs version is now under development. The Connection Machine from Thinking Machine in the USA has a 65,536-processor version. For problems like bit stream matching, for example in a Genome genetic sequencing project, these machines can be very much faster than Cray type machines. The front end of image or signal processing is another example of a problem well suited to the DAP type of array. With the

development of higher degrees of packing on VLSI chips the price of these machines will fall rapidly; and we may expect to see certain classes of project, that would otherwise use supercomputers, use the specialist massive parallelism machines, as is already happening.

Though the DAP has been used for a wide range of applications, and some 70 machines have been sold, the market that develops is likely to be for specialist applications that are ideally suited to bit processing, rather than for general purpose use. A version of the Connection Machine with floating-point units on one axis of the 1024 x 1024 array has been developed, which is perhaps a greater threat to the supercomputer, but a degree of special programming will always be required to take full advantage of its structure. Despite the great contribution of Queen Mary College to Digital Array Processing, through the bureau that has been run there for 10 years now, I do not really see a future for the DAP as a general-purpose machine. But we can expect to see it being increasingly developed as a special purpose front-end processor, perhaps backed by a MIMD parallel processor.

The Powerful Workstation Challenge

If a supercomputer is defined as one having more than 160 MFLOP/s performance, then at least one workstation with a special accelerator almost qualifies. The Sun 4 or SPARC computer can have a variety of Meiko accelerator boards added. Each board contains up to 16 transputers providing some 24 Mflop/s of performance, and so the six board version will provide some 144 Mflop/s—in the right circumstances. Of course, all this power is available from a machine with perhaps one or even two orders of magnitude lower cost than a Cray-type supercomputer. Now, the crucial point about the workstation is that it is essentially a single user machine. So to use such a powerful workstation is like having one's own supercomputer all day long.

At the University of London Computer Centre, some 5,000 batch jobs are run each week. The utilization, at about 80 percent, is very high, but with some 1,300 registered users it would appear that each user has some 6 minutes per week. Of course, in practice the amount a regular user receives is likely to be very considerably more, but still only a small fraction of the 10,000 minutes a workstation user can potentially obtain. So, at least in principle, the workstation user can afford to swap time for power—perhaps by a factor of 100 or even 1,000. So, in principle, if one needs a 160 Mflop/s computer one could use a 1.6 Mflop/s workstation running for hours at a time. However, it must be doubted if such powerful workstations have yet made much impact on the true supercomputer market. On the other hand, the specialist vector processor add-ons certainly must have made a noticeable impact at the lower end of the supercomputer market.

But now let us consider the impact of progress on computer elements. If a normal PC can produce about 0.1 Mflop/s, or 1.5 Mflop/s with a T800 transputer, then by the turn of the century this will be, say, 10 Mflop/s, or even 100 Mflop/s. By then there will probably be single-chip processors producing 100 Mflop/s. Indeed a 10 Mflop/s transputer must be expected within three or four years, so a 100 Mflop/s chip processor by the end of the century does not seem unreasonable, possibly even an underestimate. So we are going to see workstations with a few processor accelerators providing hundreds or even thousands of Mflop/s within ten years, selling for a few thousand pounds. Remember, INMOS are already talking of a $2 per Mips transputer—available today! At this point one can see that the conventional supercomputer market will look considerably dented, to say the least, at the lower end of the power range. Maybe the Cray company has been right to resist producing a relatively cheap minisupercomputer to fight off the competition from the vector processor add-on firms.

Supercomputer Survival?

The foregoing analysis is, of course, singularly flawed by contrasting the current use of supercomputers with the power of system available in ten years' time. The true picture is only obtained if one looks at the growth in market demand that will occur over this decade. It is notoriously difficult to predict market growth, but perhaps one can get some indication by looking at what has happened to the Cray market over the 1980's. By the end of 1989 there were some 600 Central Processor Units (CPU's) installed, against 21 at the beginning of the decade—a factor of nearly 30; and of course the power of each CPU has considerably increased. So the relative performance increase is that about 70 times as much Cray power is installed now as was in 1980. The current trend seems to suggest that this will continue, but of course one can't be certain. Yet the rate of growth of installed power seems to have been drastically accelerating over the past decade, though there seems to be some sign of a recent decline in the number of systems installed.

When one looks at the associated memory, an even more startling acceleration seems to have occurred. The installed memory associated with the supercomputers has gone up five hundred times! And this extraordinary growth leads one to a very important factor in supercomputer use, the large memories available. It is this factor, perhaps more than any other, that leads to the survival of the supercomputers; the previous section considering simple processor power ignores the large, indeed massive memories that are often associated with supercomputer-type power requirements. The Cray market survives and indeed grows because of fast access to massive memories as well as fast processing.

On the other hand, this discussion has not considered the growth of demand for interactive use of Crays. This is already happening to a limited extent, and the demand is certain to grow. But of course interactive use is simple and efficient for dedicated workstations, much more

difficult to handle efficiently for a multi-use supercomputer. However, there are situations where interactive use combined with massive power would be extremely valuable. Consider the case of modeling a car for crash safety design. This can now be done within acceptable time using a powerful supercomputer. Now suppose there were ten or a hundred times the power available. It would become feasible to sit at a console and modify the design until a satisfactory safe or economical design was achieved in the one interactive session. No doubt there are numerous other examples, where considerable power is required before interactive working becomes useful. Of course, the cost of supercomputing will have to fall for such applications to be economic propositions. Nevertheless, interactive use of supercomputers seems certain to grow to the point where it becomes a major factor in the market, just as has happened in most other classes of computing.

On balance, one can discern that the market for computers with supercomputer power is going to grow dramatically over the current decade. Some part of this growth will be met by powerful dedicated processors, some part by multiple processor machines, some part by the massive processor machines. But a larger part will remain with the Cray type machines, with not just their large and ever-increasing power, but also their massive memories and large memory access rates.

This paper has concentrated on the Cray Research machines, as the benchmarks for the market aimed at, as befits the machines having, by far, the largest market. Whether Cray Research can maintain this lead over their rivals over the next decade is beyond the scope of this paper. It will depend not only on the technical success of the company and their rivals, but also on political matters like the extent to which governments, who always form the largest single customer for supercomputers, permit an open market. History suggests that it will much help Cray Research if they continue to cooperate closely with Seymour Cray and his Cray Computer Corporation. To split the market can benefit no one, while strong competition from Japan is threatening the very existence of the two companies.

In conclusion, it is wise to remember that, though the growth of demand for computer power seems endless, it cannot go on—not necessarily through the technology running out of steam, but because we, humans, are running out of numbers and time to program them.

DEFENSE INDUSTRIES

European Cobra Radar Contract Awarded

90AN0225 Paris ELECTRONIQUE HEBDO in French 22 Feb 90 p 40

[Text] Thomson-CSF, Siemens, Thorn EMI Electronics, and General Electric, which make up the Euro-Art consortium, have just won a contract worth more than Fr 1 billion to develop the Cobra anti-aircraft battery radar. This radar is designed to locale the exact positions of several enemy artillery batteries simultaneously, even in the face of severe jamming.

It will take three years to develop this European radar system, followed by a two-year test program on three prototypes. Mass production of operational systems on behalf of three countries (Britain, France, and the FRG) will be the subject of a subsequent contract, estimated to be worth more than Fr 4 billion.

Cobra is based on the utilization of an entirely solid-state active aerial. General Electric owes the right to participate in this European program to its experience in the subject, as well as the vast potential market which could open up in the United States.

Thomson-CSF has developed the GaAs technology necessary for this new aerial with the help of the General Armaments Delegation [DGA, of the French Ministry of Defense].

FACTORY AUTOMATION, ROBOTICS

French Industry Increases Use of Robots

90WS0012C Duesseldorf VDI NACHRICHTEN in German 2 Mar 90 p 24

[Text] More and more robots are being introduced in French industry. To be sure, the number of robots represents just half the level of automation present in the Federal Republic of Germany, but the increase of 25 percent in 1989 is the same rate of growth as in Germany. A study of the Association francaise de robotique industrielle (Afri) revealed that 7,063 robots had been installed in 1989, compared with 5,658 in the previous year. This increase of 1,400 automatic machines was much higher than in past years.

The most important users are the automobile industry and its suppliers. According to Usine Nouvelle, this industry, which has 48 percent of all the automatic machines in France, absorbed about 47 percent of the newly installed robots. Still a certain stabilization of demand has become evident in the automobile producers. In 1989 they took 485 robots, not significantly more than in the previous year (483), while the investment of the suppliers in robots climbed steeply. Those branch industries, which in 1987 had only 350 robots, introduced 650 in 1989. This can be attributed to a temporary measured consolidation of the Tautomobile producers, where the robots are mostly used for spot welding in the truck industry, while their use in assembly work is still in the beginning stage. In automatic welding, spot welding machines appear to be increasingly replaced by trajectory welding machines. But the use of robots in other industrial branches is also increasing in leaps and bounds. In the plastics industry, especially, where the development of automatic machines that take the finished plastic parts from the injection molding machines, the number of robots has jumped from 370

machines in 1987 to 740 in 1989. The food and the chemical industries, which in 1989 employed 180 and 190 automatic machines, respectively, the number of robots had doubled within two years. The machinery manufacturing industry, which in 1989 with 1,200 robots was the second most important user of automatic machines after the automobile industry, showed only an average increase of 23 percent in 1989. So far, robotization in the electrical and electronic industries, with their 563 machines, is less impressive.

Italy: Status of CNR Robotics Program Reported

90MI0182 Turin MEDIA DUEMILA in Italian Mar 90 pp 56-62

[Article by Nicoletta Castagni: "From The 'Intelligent Hand' To The 'Robotic Foot'"]

[Text] The CNR's [National Research Council] Finalized Robotics Project, launched only ten months ago, was the topic of the first annual conference held in Rome from 13 to 15 February to examine the project's status. For three days the directors of the subprojects and those in charge of the operational units presented detailed reports on every single research activity. Although this was not a coordinated effort, it provided a good overview of what Italy is doing in the robotics sector.

The meeting was uncoordinated in that many of the activities were made public for the first time. This was done to inform a large number of researchers involved in the project on what is happening in each subproject and certain lines of research, as well as to provide a basis for further internal cooperation. Only at the end of the three-day conference did the directors of the project and the subprojects give a general outline of the state of the art in Italian robotics, thanks to information obtained from the researchers who were present. The impression was that in some way, a greater working integration is being sought to partially avoid shortcomings in a finalized project that arrived years too late and with funding that is at least four times less than required.

Preliminary activities relating to the Finalized Robotics Project began in 1973, while the prefeasibility study (begun in 1981) was completed only ten years later. The feasibility study was finally ready in 1986, and the following year CIPE [Interministerial Committee for Economic Planning] approved the funding that led to the restructuring of many objectives. Proposals started to arrive with the opening of the call for proposals and finally, in May 1989, the project was actually launched. Opening the conference, Giorgio Ausiello, president of the project committee for the Finalized Robotics Project, described the project as being divided into four subprojects:

1) The structure and skeleton of the robot, the mechanical part of the project;
2) The robot control, that is, the robot's local nervous system, which in technological terms means software and microelectronics;
3) The sensors, or "organs" that perceive the outside world, and actuators, or the automaton's muscles;
4) Control, the testing system for the robot's programmed action, self-control, and cooperation with other robots.

These four subprojects include 19 lines of research, 38 objectives, and 150 operational units. Government funding is projected to be 67.777 billion lire over five years, while 15 billion lire will come from industry for a three-year period. Due to well-known bureaucratic red tape, investments did not exceed eight billion lire in 1989, leaving several lines of research inactive, such as the analysis of the robotics market. Funding in 1990 will increase to approximately 10 billion lire, to reach the 15 billion targeted until the end of the project. There will also be increasing industrial participation (which will participate with a 50 percent funding according to consolidated procedures in international research).

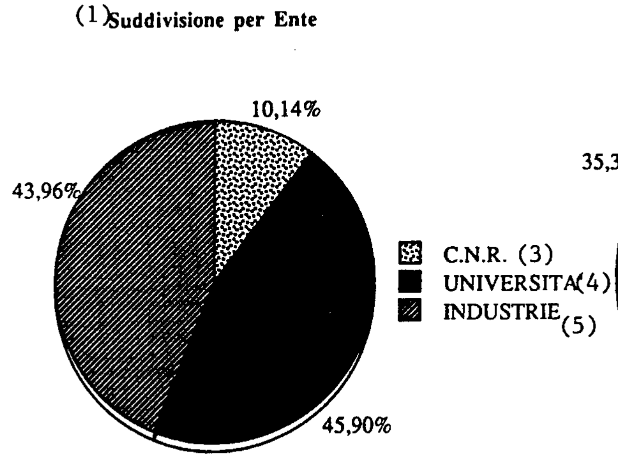
These simple figures hide many things. First, the special feature of this finalized project. As the CNR sees them, finalized projects are major lines of research that support industrial activities as well as innovative strategies that must assist the manufacturing world in dealing with competitive international markets in specific sectors.

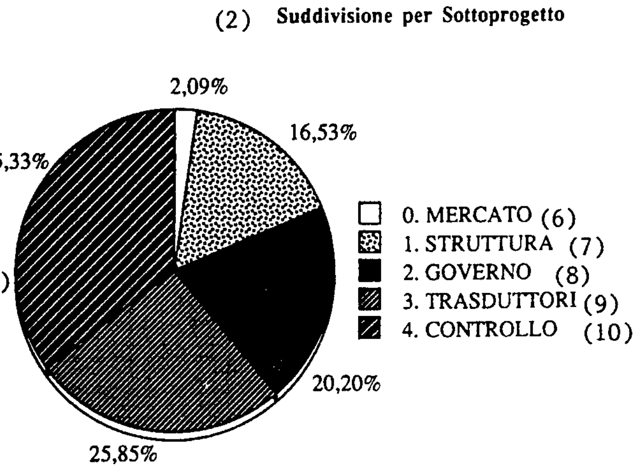
The project director, Umberto Cugini, repeated several times during the conference that Italy is extremely strong in the field of robotized systems. Companies such as Comau export worldwide, and Italy has achieved an excellent fourth place in world classifications. However, while Italian industry is very good at designing systems, it is definitely weak in the components sector.

Robotics trends are changing, however, thanks to prospects for using robots not only in factories but also in unstructured places such as the seabed, on top of skyscrapers, inside houses, or in city sewage systems. Without considering the almost complete dependency on component manufacturers (there are many components in a robot, from microprocessors, to sensors, to motors, etc.), the robotics sector is a danger to itself since it is at the mercy of prices and supplies. According to Mr. Cugini, the goal of the Finalized Robotics Project is to strengthen the national components industry with a view to developing something new at the most advanced stages in harmony with research being conducted in the United States and Japan. In doing so, industry can make up for lost time in fully-developed sectors such as the mechanical sector.

Obviously, with such a low level of funding, the research and industrial sectors chose neither very decisive nor very innovative objectives, which were oriented more toward the past than the future. The possibility of theoretical studies and higher quality practical developments is therefore being postponed to a second segment of the project. However, the call for proposals for Subproject 3 involving research on sensors, which is one of the favorite issues in artificial intelligence, received a large number of responses. There were few proposals for

1990 Funding





Key: 1. Divided into Institutes—2. Divided into Subprojects—3. CNR —4. Universities—5. Industries—6. Market—7. Structure—8. Control—9. Transducers—10. Testing

Subproject 1 involving the structure, since the mechanical part seems to be taken for granted and is the least attractive aspect. Yet this is the area where objectives, such as those for the other subprojects, will develop into prototypes with the integration of operational units and high quality, highly qualified working groups.

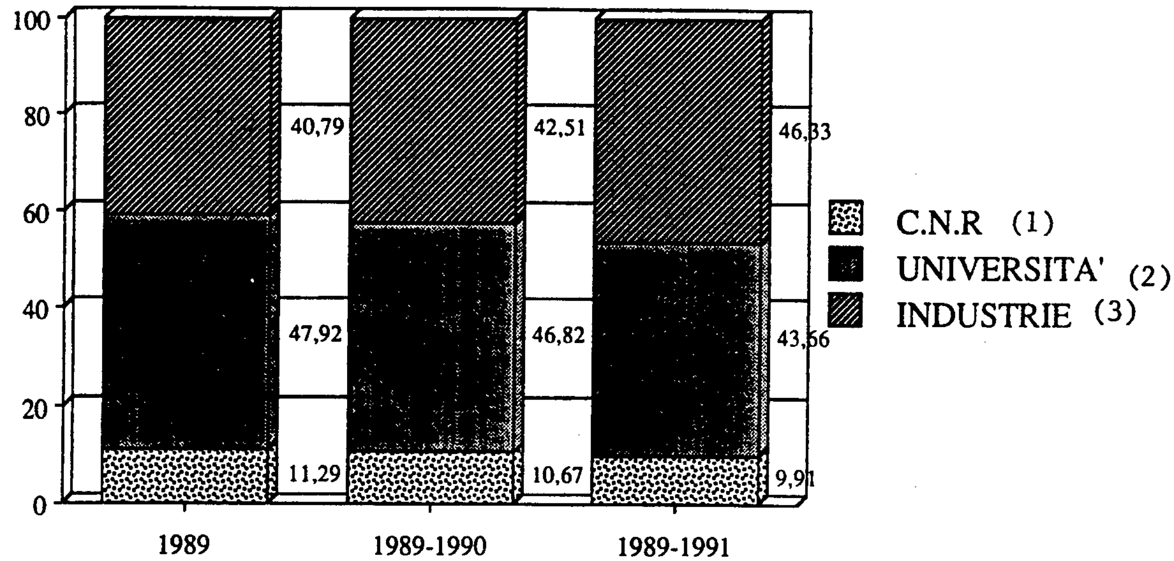
Ario Romiti, director of the subproject on structure complained about the limitations of this area of research. He stated that although the mechanical part of the robot is considered the result of a technology that is by now fully developed, it nonetheless continues to be very important with a high innovation content, as demonstrated by the most recent developments in the aeronautics and defense sectors. According to Romiti, new solutions are needed above all in the field of precision mechanics. Unfortunately, Italy cannot boast great traditions in this field and the Finalized Robotics Project could even represent an opportunity to start off and develop in this sector. Among the lines of research in Subproject 1, the director gave special emphasis to research on modular structures. According to Romiti, good components are needed for good mechanics and often these components cannot be found in Italy or in the rest of the world. Thanks to the module system, modular structures that aim at reducing manufacturing and maintenance costs should lead to the development of a new generation of components. Lightness is another objective of modular systems. In this way modular systems can become faster even though they have small motors that cost less. The solution could be light mobile robots, perhaps made of carbon fibers, and laser robots, even though it is difficult to make these modular. Romiti spoke of the "intelligent hand" being developed at the University of Bologna and the University of Pisa's "robotic foot" when referring to the line of research on advanced grasping elements. He commented on the genuinely interesting prospects of these two prototypes. More will be said later on about these prototypes as the best examples of research coordination and integration that emerged from the first national conference on the Finalized Robotics Project.

Marco Somalvico, director of Subproject 2, robot control, often emphasized the fact that this field partially involves the area of artificial intelligence. Many computer scientists continue to criticize artificial intelligence despite the fact that this can lead to important results in the robotics sector.

Subproject 2 is divided into three lines of research: Microcomputer architecture, programming languages and systems, and artificial intelligence methods and techniques. The first line has one objective, ERMIA [Enhanced Robotic Multiprocessor Integrated Architecture]: This deals with the study of architecture as a reference for control units that can be applied to a complex variety of robots. Somalvico stated that they are currently dealing with the two different standards on the Motorola 68000 and the INTEL x86 computers. The subproject decided to follow both standards with the possibility of looking for a third, flexible solution. The prototype of this third solution (along with the prototypes of standard architectures) will be presented at the end of the three-year period.

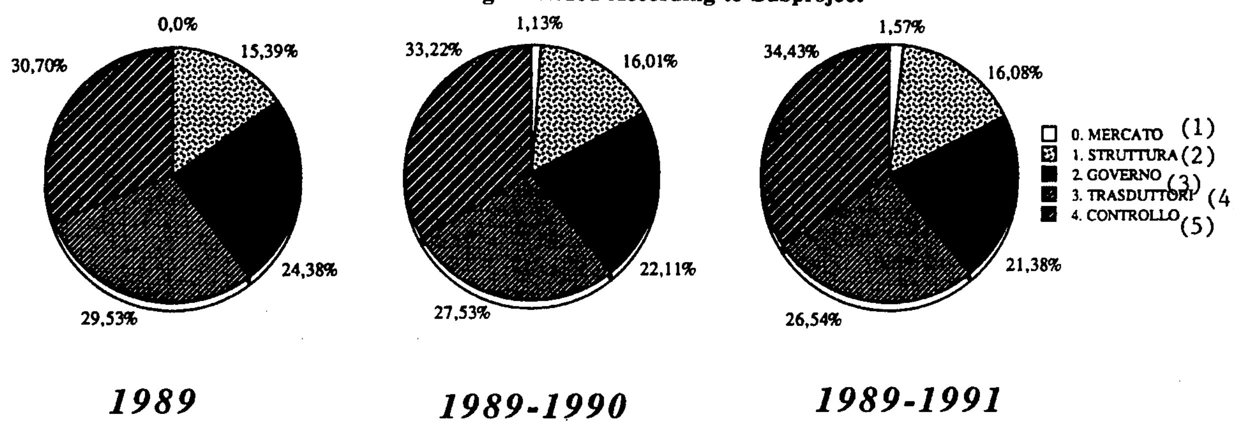
The second line of research on programming systems and language has two objectives: ALPI [Advanced Languages and Environments for the Action Planning of Sensory-Integrated Robots] and PRORA [Programming System for Manipulation Robots Oriented to Recognize Assembly and Handling Form Features]. ALPI will provide a critical review of environments and languages for planning the robot's actions. Once again Somalvico underlined the fact that there are two contrasting trends: The European and the Japanese philosophy. The example followed by industries in the Old World

Funding—By Institute



Key: 1. Industries—2. Universities—3. CNR

Funding - Divided According to Subproject



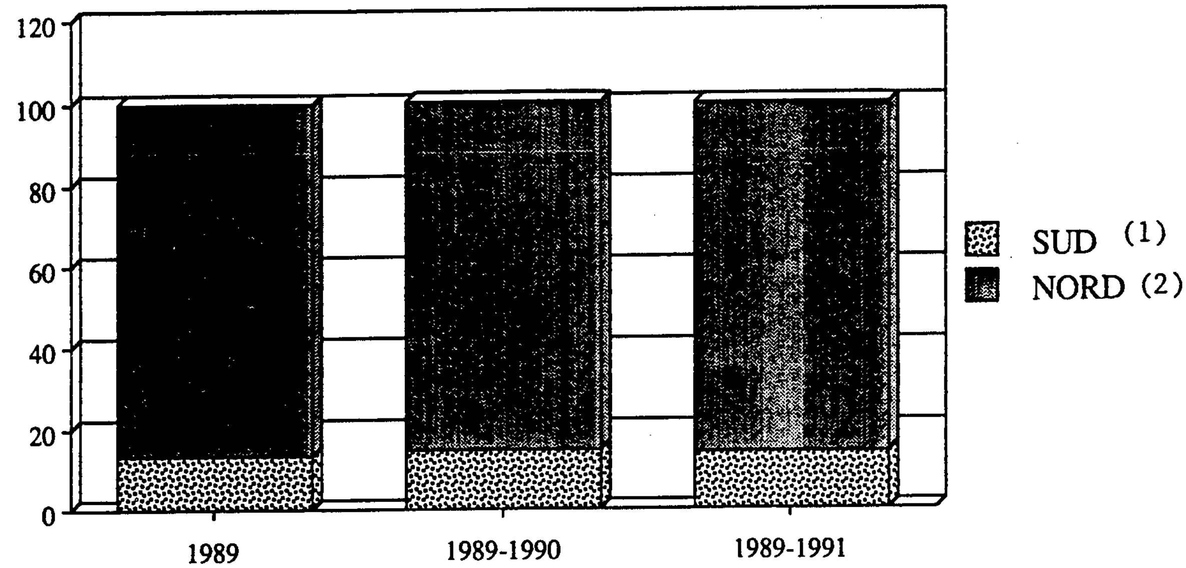
Key: 1. Market—2. Structure—3. Control—4. Transducers—5. Testing

involves two rules, an explicit and an implicit one. However, the Japanese intend to concentrate on explicit programming rules only that are so much simpler than European rules, and even use Basic. As always, there is a third solution, an American one this time, which is less clearly defined to better adapt to sophisticated sensorial accessories and robots for nonindustrial tasks. Instead, PRORA aims at choosing a prototype method for prototype models.

The third line of research on artificial intelligence methods and techniques also has two objectives. FABER [Factory Assistance Based on Environments for Reasoning] is being used to develop the connecting element between the control units of both the "white robot" and the robotized island. This is a fundamental link in an advanced robot system as it greatly reduces the island's high level of breakdowns. The "white robot" that diagnoses and supervises the robot island is consequently an indispensable factor of strength since the construction of large complex systems, such as islands, that do not break down is wishful thinking. TISANA [Techniques of Artificial Intelligence for Dynamic Scene Analysis in Navigation Robots] involves the development of sensor prototypes that can follow moving scenes.

Vincenzo Tagliasco, director of Subproject 3, sensors and actuators, spoke at length on sensors. He called the subproject an anomaly and brought up a bone of contention that still exists in the first year of the Finalized

Funding for Northern and Southern Italy



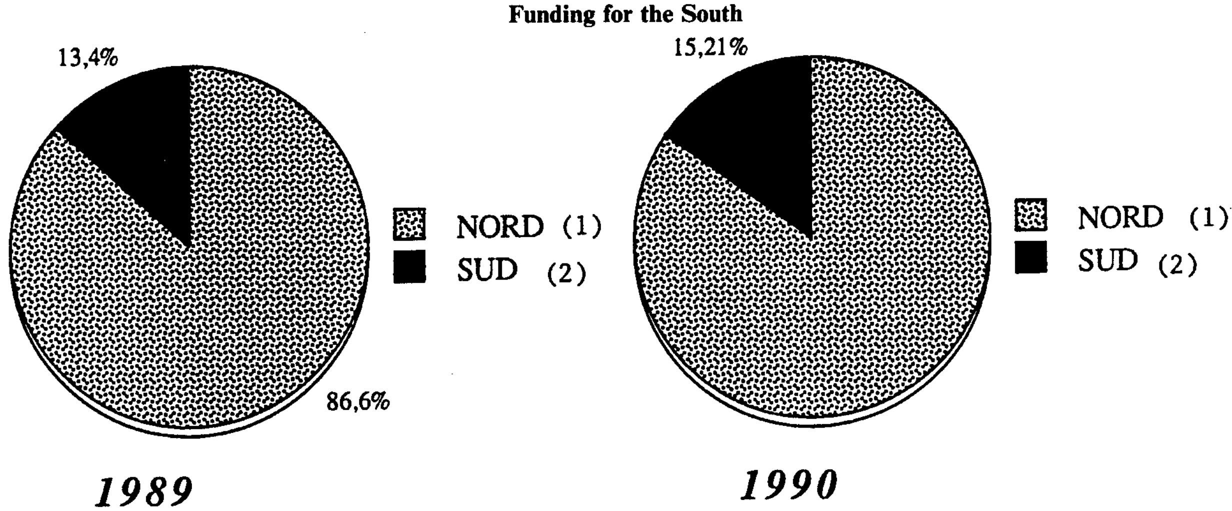
Key: 1. the South—2. the North

Robotics Project. According to Tagliasco, all the fields that did not easily fit into the other subprojects were grouped under this subproject because there is no tradition of high technology components in Italian industry. Furthermore, there is no homogeneous culture of sensors and actuators in the academic world or at the CNR. The fragmented tasks (which are sometimes quite important), uncertainty, and new research fields to led to the conception of the project, and Subproject 3 in particular.

Tagliasco is not completely pessimistic. The finalized project can be transformed into an authentic reference network for what is being done in Italy in the unlimited field of sensors. The goal is to develop prototypes, laboratories, and testing grounds for the evaluation of sensors, with continuous reference to regulations and standards. Tagliasco stated that in this way, none of the large number of already operational realities that had produced interesting results prior to the initiation of the Finalized Robotics Project will be favored. This will also help the numerous other realities that have just been formed as a result of the project and that want to emerge with good ideas.

Subproject 4, robot control, directed by Fernando Nicolo contains fewer structural problems, and is the computer science heart of the Finalized Robotics Project. The subproject includes four areas of research:

Funding for the South



Key: 1. the North —2. the South

The dynamic hybrid control of interacting robots, qualifications of the working robot, planning movements, and configuration and handling of robot systems. Nicolo stated that a carbon fiber robot and a prototype for two industrial robots are already in an advanced construction stage in the first line of research. These will be used to evaluate the robot's capacity to test its learning skills, because each time the machine goes by, the robot learns how it must modify itself to accomplish its task well.

An example of integration, which the director of the Finalized Robotics Project, Umberto Cugini, is always happy to speak about, is the development of the previously mentioned "intelligent hand." This is a truly interesting example and although strictly part of Subproject 1, also heavily involves Subprojects 2 and 3. The first version is still a little primitive, and can be seen at the University of Bologna. It is the result of a joint effort between IBM and DIEM (the Department of Mechanical, Aeronautical, and Nuclear Construction and Metallurgy). There are only 10 research prototypes of the "intelligent hand" in the world. It is an extremely flexible solution to the current robot arm whose pliers must be changed according to the piece to be manipulated. This naturally results in a severe reduction in production times. According DIEM's Vassura, the second generation prototype that will be created in Bologna over the three-year period will consist of a hand with three modular fingers. In fact, the fingers are made of a large series of interconnected articulated joints, and each of these joints is in turn controlled by a motor inside the robot's arm. The hand is also connected to this motor so that grasp and strength may be varied. Three powerful computers govern the impulses that are needed by the motor each time to change the configuration and pressure on objects. The fingers will also be equipped with an intrinsic sensor currently being developed at the Scuola Superiore di Sant' Anna in Pisa, which is based on sensors with artificial skin. A number of research centers in Tuscany are at the forefront in this field. A special contribution for the hand's control system will come from Subproject 2, an agreement that was reached when the project was described at the conference on the Finalized Robotics Project.

MICROELECTRONICS

EC Demurs Signing Integrated Circuit Protection Treaty

90AN0318 Brussels EC PRESS RELEASE in English No IP(90) 390 16 May 90 pp 1-3

[Report: "The EC Commission Decides Not to Sign the Treaty on the Protection of Intellectual Property in Respect of Integrated Circuits (The Washington Treaty)"]

[Text] On behalf of the EC Commission, Vice-Presidents Martin Bangemann and Frans Andriessen today issued a statement ruling out the possibility that the Commission would for the time being be proposing an adherence by the Community and Member States to the Washington Treaty on integrated circuit protection. The statement emphasized the need to avoid prejudicing the negotiations currently under way in the GATT-Uruguay Round on the trade-related aspects of intellectual property rights (TRIP's), in which the Community is playing a key role.

While the statement means that the Community will not be exercising its option to sign the Washington Treaty (the deadline for which expires on 25 May 1990), the statement makes it clear that the possibility of adherence at a later date remains open.

The Commission will keep the situation of the international protection of integrated circuits under review and reassess the necessity to adhere to the Washington Treaty in 1991.

Background

The Washington Treaty on the protection of intellectual property in respect of integrated circuits was adopted at a diplomatic conference held under the auspices of the World Intellectual Property Organisation (WIPO) in Washington DC from May 8-26, 1989. It is an entirely new multilateral treaty for the international protection of the designs of integrated circuits, to be based, as with other intellectual property treaties, on the principles of minimum standards and national treatment. The Community is largely competent in this subject matter by virtue of the Council Directive of 1986 on the legal protection of topographies of semiconductor products, although Member States remain competent in some aspects.

The Treaty has proved to be controversial because of its outright rejection by the United States and Japan, the two most important world producers of integrated circuits, on the grounds that it does not set high enough minimum standards of protection. However, certain other industrialised countries, while not denouncing the Treaty in such forthright terms, have also argued within the TRIP's negotiations for higher standards of protection than are provided in the Treaty.

In April, the Community submitted within the GATT negotiations a comprehensive new proposal for an agreement on TRIP's which would include an obligation to respect the substantive provisions of the Washington Treaty, subject to additional provisions in three key areas which would result overall in a standard of protection equivalent to that so far adopted in the laws of the Community, the United States, Japan and other countries.

Joint Statement by Messrs. Bangemann and Andriessen on the Subject of Possible Adherence by the Community and Member States to the Washington Treaty

1. In May of last year, a diplomatic conference was held in Washington DC under the auspices of the World Intellectual Property Organisation (WIPO) with the aim

of concluding a multilateral Treaty on the protection of intellectual property in respect of integrated circuits.

2. The Conference adopted a Treaty text (the "Washington Treaty") by a large majority, although Japan and the United States, the two largest producers of integrated circuits, voted against it on the grounds that certain of the standards set by the substantive provisions of the Treaty were too far below those which had been adopted as de facto standards by the countries which had so far developed legislation on this subject. The Community, while acknowledging that considerable sacrifices had been made in the area of standards for protection, voted for the text because the overall compromise was judged to be acceptable, particularly in view of the importance attached to the furtherment of multilateralism within the framework of WIPO. However, the Community, in common with most other delegations, did not actually sign the Treaty. Instead the Commission spokesman, on behalf of the Community and the Member States, undertook to give careful consideration to possible adherence at a later date, while emphasising that the quest for improved standards of protection in this area would continue.

3. In the context of the Uruguay Round of negotiations within the GATT, intellectual property, which includes the question of the protection of integrated circuits, occupies an important place. The Community has taken the initiative of proposing that the protection of integrated circuits be included in the future GATT agreement on trade-related intellectual property rights. In the draft agreement recently submitted in Geneva, it suggests that contracting parties comply at least with the substantive provisions of the Washington Treaty, subject to certain additional provisions concerning the term of protection, remuneration in the case of innocent infringement and nonvoluntary licences. It is hoped that this proposal will constitute a compromise acceptable to other interested parties.

4. We are of the opinion that in the light of the current state of the GATT negotiations, the time is not now right for a Community decision on signature or accession to the Washington Treaty. Any decision either to accept or positively to reject the Treaty would influence the course of those negotiations, and would reduce the ability of the Community to play, as it has been doing with some considerable success so far, a key role in the negotiation process.

5. Accordingly, the Commission will not be making a proposal to the Council that the Community and Member States exercise the option of signing the Washington Treaty before 25 May 1990. This does not mean, however, that eventual adherence to the Treaty has been ruled out, and the Commission will continue to keep the matter under review.

JESSI: Siemens Requests Subsidies for 64M Chip Project

90MI0210 Bonn TECHNOLOGIE NACHRICHTEN-MANAGEMENT INFORMATIONEN in German 12 Apr 90 p 4

[Text] Siemens AG of Munich has made an application to the FRG Research Ministry for a 1.4 billion Deutsche mark [DM] subsidy to develop the 64-Megabit chip as part of the European microelectronics program, JESSI. The maximum subsidy level for JESSI projects is set at 50 percent of the total costs of each project. In fact, research ministry officials in Bonn expect Minister Heinz Riesenhuber to decide on a lower limit and approve much less than DM700 million in view of the financial burdens that the planned monetary, economic, and social union with the GDR will place on the FRG's resources. However, Siemens AG's subsidy application will be considered controversial in any case. The DM320 million grant for developing the 40-Megabit chip with Philips had already met with strong criticism, especially from medium-sized firms.

The bone of contention regarding the decision on the JESSI subsidy is the recent agreement between Siemens and IBM to jointly develop the 64-Megabit chip. There are fears in Bonn that the grant that Siemens receives under the JESSI program might be used directly or indirectly to fund its cooperation with IBM in Armonk, United States, where the bulk of both firms' work will take place. The BMFT does not share this worry, however, but feels that the Siemens-IBM agreement makes it more certain that the JESSI targets will be met and will bring this modern technology onto the European market a good 18 months in advance of existing JESSI schedules. It is also thought that it will be possible to monitor use of the purpose-linked subsidy funds. In a statement on the agreement between IBM and Siemens, the JESSI board, which has overall control of the JESSI project, also declared that after careful examination of the facts, it had found that the contract supported the aims of JESSI. It went on to state that the cooperation expected in the future between the JESSI organization and IBM Europe provided grounds for anticipating a further strengthening of JESSI's position, especially in the joint development of manufacturing equipment and in the building of prototypes.

FRG Considers GDR Participation in JESSI Program

90MI0212 Bonn WISSENSCHAFT, WIRTSCHAFT, POLITIK in German 25 Apr p 4

[Text] "The Federal Government does not view the COCOM list with satisfaction." This is how the FRG Minister of Research and Technology, Dr. Heinz Riesenhuber, cautiously phrased his position on the western system for controlling exports to the East European states. Speaking at a press conference on the status of the European microelectronics program, JESSI, he strongly advocated technological and technical cooperation with

democratically structured East European states as "expressly desirable and worth striving for." The Federal Ministry of Research and Technology (BMFT) is currently considering whether GDR companies such as Robotron or the Dresden-based Microelectronics Center should be admitted to the European JESSI program.

The Federal Research Minister said that the central objective of JESSI was to bring European semiconductor manufacturers, user companies, and science together to form the first ever microelectronics pool. "An area of great strategic importance is the application of microelectronics," Dr. Riesenhuber stressed. He went on to state that the estimated requirement for the applications sector alone, including related basic research, was therefore in the region of 8 billion Deutsche marks [DM]—in other words, more than 40 percent of the total allocation—over the seven-year term.

Medium-sized companies in particular would be increasingly included in the JESSI program. When using specific microelements, appliance and systems manufacturers often have to transfer part of their manufacturing know-how to the producers of these components, who then not infrequently put competing products of their own on the world market. Therefore, small systems manufacturers in particular must learn to use the latest technology to transfer their knowledge onto chips by themselves. Courses and seminars will be arranged to gradually familiarize users with JESSI technology and highly integrated system design methods.

Three demonstration centers will be set up under this project at existing institutes: The Fraunhofer Society's Integrated Circuits Team (AIS) in Erlangen, the Institute of Applied Microelectronics (IAM) in Braunschweig, and the Society for Mathematics and Data Processing (GMD) in Birlinghoven near Bonn. For the nineties JESSI is scheduled to provide mastery of a CAD [computer-aided design] system with a complexity of up to 10 million transistors per chip and 100 million transistors in the system.

Plessey's Reprogrammable Array Described

90AN0180 Paris ELECTRONIQUE HEBDO in French 11 Jan 90 p 16

[Article by Francoise Grosvalet: "Gate Arrays Can Now Be Modified Online"]

[Text] Plessey is expanding the concept of programmable gate arrays. In addition to being user programmable, the "Electrically Reprogrammable Array" (ERA) can also be totally or partially reconfigured within the application.

Taking up the idea of programmable arrays invented by Xilinx in 1985, Plessey Semiconductors is going a step further by introducing a sea-of-gates circuit which is not only user programmable, but can also be reconfigured online. In essence, this means that the circuit, once integrated into the system, can still be wholly or partly modified by the user according to the needs of the application. This feature is also available in Xilinx' expensive Logic Cell Arrays (LCA) but is limited to the total reconfiguration of the circuit based on a customization program loaded into a nonvolatile memory.

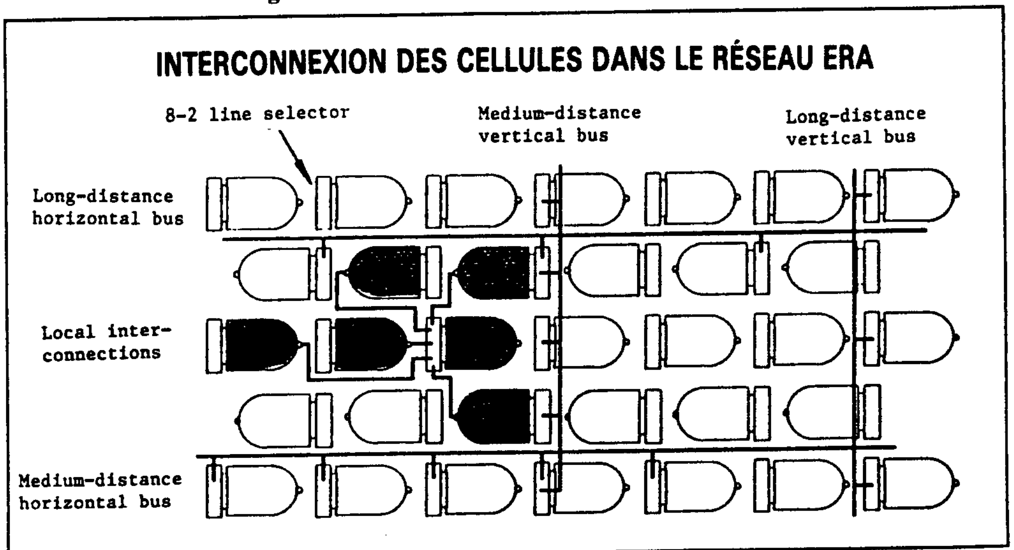
Another notable difference between the two approaches is that Plessey's device is a real sea-of-gates array circuit (the basic element is a cell which can either operate as a NAND with two inputs or as a latch), whereas in the Xilinx circuit, the gates are already interconnected within what the U.S. manufacturer calls configurable logic blocks.

40,000 Gates by Year-End

On the one hand, this approach leads to more flexibility of application, including the possibility to switch to a more economical and conventional gate array or standard cell approach once the design has been finalized and tested in the application. On the other hand, it allows greater integrated density and a higher system frequency. The first programmable sea-of-gates circuits, called Electrically Reprogrammable Arrays (ERA6OK), can integrate up to 10,000 gates at a 40-MHz user frequency. This should be followed by a 20,000-gate model in the second quarter of this year and by a 40,000-gate circuit in the third quarter. These circuits, which use static RAM memory cells for interconnection (as do Xilinx's), are today manufactured in 1.4-micron complementary metal-oxide semiconductor (CMOS) technology using three metal interconnection levels. By 1991, the implementation of 1-micron technology should allow 80,000 gates and 70-MHz. By then, the static RAM memory cells could be replaced by nonvolatile memory cells within the framework of the agreement signed last July with the small U.S. company Simtek. This would eliminate the need for auxiliary memory to store the configuration program. The similarity between the Xilinx and Plessey approach, however, only involves the choice of static RAM cells and not their arrangement in the circuit. Plessey bought its licence from a British company, Pilkington Electronics, which developed the ERA concept. Here, each gate is linked to several memory points, with a total of 25 Kbits on a 10,000-gate circuit. Pilkington also developed a packaging and routing software that runs on a PC-386 that is now being sold by Plessey, which bought the licence, for Fr 60,000. For diagram acquisition and simulation (which is similar to that of conventional arrays), Plessey uses View Logic tools. Plessey uses for its ERA circuits the same cell and macrocell libraries as for its conventional gate arrays, which makes it possible to switch fairly rapidly to larger scale production techniques at reduced costs. There are also plans to run development software on conventional workstations in the near future.

Plessey's ERA's will initially be used for the development of prototypes or for small-batch production: a competitor for manufacturers using electronic masking devices. But the possibility of online reconfiguration may well reveal other applications, particularly in robots.

Figure 1. Cell Interconnection in the ERA Circuit



Each cell in the circuit can be directly connected to five others through local interconnections. Thus, more complex functions can be built which are then interconnected via horizontal and vertical medium-or long-distance buses.

Plessey's first programmable array, the ERA-60100, consists of a logical core containing 10,000 gates arranged within 2,500 cells and 84 peripheral input/output (I/O) cells which can be configured in different ways. The configuration of each logical cell uses 10 bits of RAM, while that of an E/S cell only needs 4 bits. To create more complex cells, each logical cell can be directly connected to any of its immediate neighbors using a local interconnection bus. These macrocells are interconnected by horizontal and vertical medium-distance (occurring every 10 cells) and long-distance (covering the chip length) interconnection buses. Thus, the ERA-60100 contains 100 long-distance buses, 750 medium-distance buses, and 12,500 local interconnections. In addition, a peripheral 10-bit bus accessible from inside or outside runs all around the chip. This bus can be used either for data transfer or for time and activation signals.

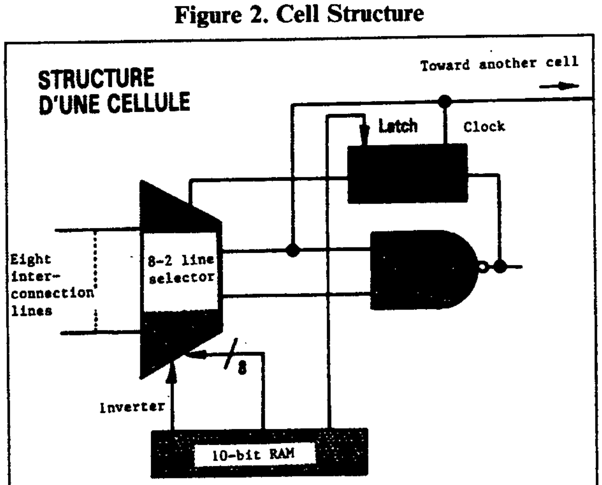
350 Microseconds To Configure 10,000 Gates

The I/O cells can also be configured to supply up to 12 mA and produce typical propagation delays of 2.5 nanoseconds at full speed. The typical propagation delay for a NAND gate loaded at two inputs is 2.5 nanoseconds (200 MHz in triggering frequency for a master-slave flip flop). Typical cell consumption ranges from 10 nanoamperes in idle to 10 microamperes/MHz in operational state.

The loading of the interconnection program stored in external memory can either be done sequentially or in parallel either under the control of the circuit itself or by using an external generator. In any case, using parallel mode the total configuration of the 10,000-gate circuit does not take more than 350 microseconds. The circuit, which operates at 5 V, is contained within an 84-pin plastic pin grid array. It covers a silicon surface of 7 x 7 mm^2 compared with 5 x 5 mm^2 for a conventional gate array of the same complexity. But, thanks to the use of three metallization levels, the 40,000-gate model should not exceed 11.5 x 11.5 mm^2. Although all the gates can hold logical functions—just as in the traditional sea-of-gate circuits—the average activity rate does not exceed 50 percent for complex designs; however, it is possible to reach 95 percent for highly synchronized circuits.

The sample ERA-60100 costs Fr 500 per 100 pieces. It is available, as is its associated development system, at any Plessey Semiconductors outlet which specializes in electrically reprogrammable circuits, plus, in France, at CGE Components and ICC of the Sonepar group.

Figure 2. Cell Structure



Each cell can be configured as a NAND gate or as a latch. The selector, controlled by the 10-bit RAM, can be used to program the inputs to achieve a direct connection with adjoining cells. The inverter control interconnects the two inputs when the cell is used as an inverter.

Italy, Japan Form Liquid Crystal Display Joint Venture

90MI0196 Turin MEDIA DUEMILA in Italian Apr 90 pp 94-95

[Text] Japanese displays are arriving in the Aosta valley. The new Tecdis plant, a joint venture company formed among Seiko Instruments, Teknecomp (Olivetti group), and Aeritalia was established a few weeks ago at Chantillon. The company will be involved in the design, production, and marketing of liquid crystal displays (LCD). The plant, which was completed with a contribution from the Aosta valley regional government (the total investment exceeds 50 billion lire), extends over an area of more than 27,000 square meters (10,000 of which are covered). A total of 120 people are employed, a group of which is involved in research and development.

The Tecdis plant is the most advanced in Europe in terms of both productive capacity (40,000 square meters of LCD) and technology. It is capable of marketing "all existing LCD technologies." One particular technology is TN (twisted nematic), which requires minimum voltage for piloting, guarantees rapid response time, wide temperature margins, and has applications for all LCD'S and modules up to 40 characters on four lines. STN (super twisted nematic), on the other hand, adapts to high contrast alphanumeric and graphic displays, while RCF (retardation compensation film) technology is used for black and white displays. Each of the three variants can be backlighted to optimize display performance.

In addition, color displays for all application requirements, active matrix displays for exceptionally fast response times, "chips on flex," and new interconnecting technologies are all part of Tecdis' technological development programs.

"The goal of Tecdis," as was stated during the inauguration ceremony, "is to produce quality displays, and in this way improve communications. To accomplish this, Tecdis carries out all aspects of display processing in a clean room measuring more than 5,000 square meters, where it is possible to work in special dust-free areas, under constant thermographic conditions, and by using deionized, purified water."

The directors of Tecdis also explained that at the end of the production cycle, the water that has been used "passes through a purification plant that returns it to the river free of all polluting agents and, paradoxically, much cleaner than when it came in, because of the double purification process that takes place."

Liquid crystal displays represent the most advanced technology in the field of interface videos. LCD's have applications in various sectors of computer science (personal and portable computers), office automation (typewriters, telefax machines, and printers), telecommunications, automobile components, and scientific instruments.

The following figures demonstrate the importance of LCD's: The European and world market for liquid crystal displays, according to specialized estimates, is growing continuously and in Europe will increase from $143 million in 1989 to $853 million in 1996. The current figure of $1,783 million for the world market will reach $6,286 million in 1996, with an average annual growth rate of 20 percent.

SCIENCE & TECHNOLOGY POLICY

EC Decision on Framework R&D Program

90AN0305 Luxembourg OFFICIAL JOURNAL OF THE EUROPEAN COMMUNITIES 8 May 90 pp 28-43

[Article: "Council Decision Concerning the Framework Programme of Community Activities in the Field of Research and Technological Development (1990 to 1994)"]

[Text] The Council of the European Communities,
Having regard to the Treaty establishing the European Economic Community, and in particular Article 130q (1) therefore,
Having regard to the Treaty establishing the European Atomic Energy Community, and in particular Article 7 thereof,
Having regard to the proposal from the Commission,
Having regard to the opinion of the European Parliament,
Having regard to the opinion of the Economic and Social Committee,

Whereas the Single European Act incorporated a Title VI (Articles 130f to 130q) into the EEC Treaty; whereas that Title constitutes a new legal basis for Community activities in the field of research and technological development; whereas, in particular, Article 130f lays down that the Community's aim is to strengthen the scientific and technological basis of European industry and to encourage it to become more competitive at international level;

Whereas it is necessary for the Community to encourage enterprises, including small and medium-sized undertakings, research centres and universities in their research and technological development activities and, in order to achieve that, to support their efforts to cooperate with one another by appropriate measures;

Whereas it is recognized that small and medium-sized undertakings are able to make a significant contribution to the innovative process and should play a substantial role in the implementation of Community research and technological development activities, thereby contributing to the improvement of industrial competitiveness on a broader basis; whereas, therefore, particular attention should be paid to the specific needs of these undertakings in order to encourage their access to information,

their effective participation in Community programmes and their ability to exploit the results of Community research;

Whereas under Article 130i all the Community activities referred to in Article 130g should be set out in a multiannual Framework Programme;

Whereas, following an initial Framework Programme for the period 1984 to 1987, a Second Framework Programme for the period 1987 to 1991 was adopted by Decision 87/516/Euratom, EEC amended by Decision 88/193/EEC, Euratom, and is in the process of being implemented; whereas it should be possible to continue implementing it, for specific programmes which have not yet been adopted, even after adoption of the Third Framework Programme for the period 1990 to 1994;

Whereas the Commission submitted a communication on "A Framework for Community Research and Technological Development Actions in the 1990's" on 13 June 1989;

Whereas, in addition, pursuant to Article 4 of Decision 87/516/Euratom, EEC, the Commission has examined and assessed progress in carrying out the Second Framework Programme, in particular through an evaluation report prepared by a group of independent experts;

Whereas, in view of the rapid pace of technological development, new economic challenges which the Community must meet, the increased level of global competition and the need to keep in view the horizon beyond 1992, Community activities in the field of research and technological development must be intensified and augmented; whereas, in the light of these factors, it has been judged appropriate to adopt a new Framework Programme for the period 1990 to 1994 developing out of the current Framework Programme 1987 to 1991;

Whereas the Community's activities must be based on the principle of subsidiarity, and whereas the Community's activities in the field of research and technological development must thus provide added value in relation to activities carried out at national and other levels;

Whereas efforts should be focused on a limited number of activities corresponding to the strategic objectives laid down in the Framework Programme;

Whereas it is necessary to promote the overall harmonious development of the Community with a view to strengthening its economic and social cohesion; whereas it is intended that the implementation of common policies of the Community and its strategy for research and technological development shall contribute to this objective; whereas a Community Framework Programme should play its part, along with other Community instruments, in contributing to strengthening scientific and technological infrastructure and potential throughout all parts of the Community;

Whereas the process of technological progress requires a continuum of interlinked activities, ranging from basic research through to the demonstration of the applications of new technologies; whereas, however, the precompetitive aspect must remain central and still take priority in Community research and technological development;

Whereas the prenormative dimension referred to in Article 130f of the Treaty could enable Community research and technological development activities to guarantee the scientific and technical basis necessary to establish adequate norms and standards; whereas such an approach will help make it easier for the Community to meet the increased responsibilities linked with completion of the single market, in other areas such as the environment, safety and health;

Whereas the Joint Research Centre is called on to contribute to the implementation of the Framework Programme particularly in those fields in which it can offer an impartial and independent expert opinion for the benefit of all Community policies;

Whereas the dissemination and exploitation of the results of research and technological development activities are essential elements in the innovative process, in particular for small and medium-sized undertakings; whereas, for this reason, each specific programme must specify the procedures for disseminating results, and provision should be made for centralized action to disseminate and exploit the results of research;

Whereas a new initiative should be launched to improve the mobility and training of young researchers at postgraduate level, particularly relying on networks of laboratories and research teams, both public and private, in Member States, throughout the whole Community;

Whereas the Framework Programme is to be implemented through specific programmes and may also be implemented through supplementary programmes within the meaning of Article 130l, participation within the meaning of Article 130m and cooperation with third countries or international organizations within the meaning of Article 130n or may take the form of joint undertakings or other structures within the meaning of Article 130o of the EEC Treaty;

Whereas a complementary relationship should be promoted between Community activities and Eureka projects which fit in with the extension of the Community's research and technological development strategy, by the choice of appropriate instruments, in accordance with Articles 130m and n of the EEC Treaty;

Whereas the Community is ready to cooperate, on a mutually advantageous basis, with third countries, particularly those which have concluded framework agreements with the Communities;

Whereas European Cooperation in the field of Scientific and Technical Research (COST) activities are making an increased contribution to the implementation of the

Framework Programme and playing a specific and complementary role by encouraging scientific and technical cooperation between the Community and the members of COST by means of research projects of a multilateral character;

Whereas it is necessary to make an estimate of the Community financial means necessary for the realization of the research and development activities envisaged, in accordance with Article 130i (1) of the EEC Treaty; whereas this amount is compatible with the financial perspective included in the Interinstitutional Agreements of 29 June 1988 for the years 1990 to 1992;

Whereas as regards the implementation of the Framework Programme in 1993 and 1994 provision should be made for the amount deemed necessary and the continuity of research activities should be ensured;

Whereas the Scientific and Technical Research Committee (CREST) has been consulted;

Whereas the Scientific and Technical Committee referred to in Article 7 of the EAEC Treaty has been consulted by the Commission and has delivered its opinion.

Has decided as follows:

Article 1

1. The Framework Programme for Community Activities in the Field of Research and Technological Development, hereinafter referred to as the "Third Framework Programme", shall cover the period 1990 to 1994. The Decisions adopted in implementation of Decision 87/516/Euratom, EEC, concerning the Framework Programme for 1987 to 1991 shall not be affected by this Decision. The remaining Decisions necessary to complete the implementation of Decision 87/516/Euratom, EEC, may be adopted.

2. The Third Framework Programme shall provide for the carrying out of the following activities:

- Enabling technologies:

1. information and communications technologies; 2. industrial and materials technologies.

- Management of natural resources:

3. environment; 4. life sciences and technologies; 5. energy.

- Management of intellectual resources:

6. human capital and mobility.

3. Without prejudice to the amount of ECU 3,125 million deemed necessary in respect of the Framework Programme for 1987 to 1991, which it will be possible to enter in the budget from 1990 onwards, the amount deemed necessary for Community financial participation in the entire programme shall be ECU 5,700 million, of which ECU 2,500 million are deemed to be necessary during 1990, 1991 and 1992 and ECU 3,200 million during 1993 and 1994.

4. The latter amount shall be intended for the financing in 1993 and 1994 of activities begun in the period 1990 to 1992. If this amount is covered by any financial perspective fixed for 1993 and 1994, it shall be deemed to be confirmed. In any other circumstances, the Council should as soon as possible take, in accordance with Article 130q (1), the decisions deemed necessary to ensure the continuity of the present Framework Programme.

5. The breakdown of the amount deemed necessary for the period 1990 to 1994 between the six activities referred to in paragraph 2 is set out in Annex I.

6. The activities referred to in paragraph 2 and their scientific and technical objectives are described in Annex II.

7. The selection criteria to be applied in the implementation of the Framework Programme are laid down in Annex III.

Article 2

1. The Third Framework Programme shall be implemented through specific programmes in accordance with Articles 130k and 130p of the EEC Treaty. For activities covered by the EAEC Treaty, programmes shall be adopted in accordance with Article 7 of the said Treaty. Each programme shall fall within one of the activities referred to in Article 1 (2).

2. This implementation may also give rise, as necessary, to supplementary programmes within the meaning of Article 130l, to participation within the meaning of Article 130m, to cooperation within the meaning of Article 130n and to joint undertakings or any other structure within the meaning of Article 130o of the EEC Treaty. In such cases the decision shall be taken by the Council pursuant to the rules of the Treaty.

3. If a decision is taken in implementation of Article 1 (4), the various specific programmes or other decisions shall be adjusted to take account of such decision.

4. Each specific programme shall determine its precise objectives and make provision for an evaluation of the results achieved as compared with those objectives and with the criteria in Annex III, which include that of contributing to the economic and social cohesion of the Community.

Article 3

The detailed rules for financial participation by the Communities in the Third Framework Programme as a

whole shall be those provided by the Financial Regulation applicable to the general budget of the European Communities.

The rates of financial participation by the Community are set out in Annex IV.

Article 4

Measures to disseminate the knowledge gained from and to exploit the results of the specific programmes and the supplementary programmes, as described in Annex II, shall be implemented, on the one hand, through the specific and supplementary programmes and, on the other, by means of a centralized action.

The amount deemed necessary for the abovementioned centralized action is ECU 57 million, as indicated in Annex I.

The detailed arrangements for the dissemination and exploitation of the knowledge gained, in particular the definition and the implementation of the centralized action, shall be the subject of a Council Decision.

Article 5

During the third year of execution of the Third Framework Programme, the Commission shall assess its progress by reference to the criteria set out in Annex III. It shall examine in particular whether the objectives, priorities and activities envisaged and financial resources are still appropriate to the changing situation. It shall also make an evaluation of all the specific programmes implemented under Decision 87/516/Euratom, EEC. It shall communicate the findings of this examination and evaluation to the Council together with its comments.

After the Council has examined this communication, the Commission shall submit to it the necessary proposals for decisions.

When implementation of the Third Framework Programme has been completed, the Commission shall make a new evaluation of that programme.

Done at Luxembourg, 23 April 1990, For the Council The President A. Reynolds

ANNEX I

Breakdown of the Amounts Deemed Necessary To Implement the Various Activities Envisaged (in million ECU)

	1990-92	Breakdown	1993-94	Total
I. Enabling Technologies				
1. Information and communications technologies	974	1,247	2,221	
—Information technologies		1,352		
—Communications technologies		489		
—Development of telematics systems of general interest		380		
2. Industrial and materials technologies	390		498	888
—Industrial and materials technologies		748		
—Measurement and testing		140		
II. Management of Natural Resources				
3. Environment	227		291	518
—Environment		414		
—Marine sciences and technologies		104		
4. Life sciences and technologies	325		416	741
—Biotechnology		164		
—Agricultural and agro-industrial research[1]		333		
—Biomedical and health research		133		
—Life sciences and technologies for developing countries		111		
5. Energy	357		457	814
—Non-nuclear energies		157		
—Nuclear fission safety		199		
—Controlled nuclear fusion		458		

Breakdown of the Amounts Deemed Necessary To Implement the Various Activities Envisaged (in million ECU) (Continued)

	1990-92	Breakdown	1993-94	Total
III. Management of Intellectual Resources				
6. Human capital and mobility	227		291	518
—Human capital and mobility		518		
Total	2,500		3,200	5,700[2,3]

[1] Including fisheries.

[2] Including ECU 57 million for the centralized action of dissemination and exploitation provided for in Article 4, drawn proportionally from each activity.

[3] Including ECU 180 million for 1990-92 and ECU 370 million for 1993-94 for the Joint Research Centre.

ANNEX II

The Activities

The Third Framework Programme of Research and Technological Development (1990-94) defines objectives for giving an innovatory thrust to Community action during those five years. The specific programmes of the Second Framework Programme (1987-91) are retained. The Third Framework Programme will be able to bring to them the necessary elements of continuity.

The selection of the broad outlines of the Third Framework Programme meets six major concerns:

- improving industrial competitiveness whilst maintaining the pre-competitive nature of Community activities;
- meeting the challenges linked to the attainment of the large market as regards norms and standards by strengthening prenormative research;
- modifying industrial operators' attitudes in the direction of further transnational initiatives;
- introducing a European dimension into the training of scientific research and technological development staff;
- increasing economic and social cohesion whilst ensuring the scientific and technical excellence of research projects;
- taking into account environmental protection and the quality of life.

The choice of scientific and technical objectives rests *inter alia* on the principle of Community added value and subsidiarity. In this sense, the criteria laid down for the previous Framework Programme and set out in Annex III take on an added significance; they will be taken into account in the evaluation of the different activities.

There will be greater consultation of representative scientific, technical and industrial bodies in the Community.

In industrial programmes, the emphasis will be on precompetitive research and technological development. The main objective will be to contribute to strengthening the technological bases for the development of standards in order to encourage the attainment of the single large market, thus making it possible for industry to invest in the design of products on the basis of common standards. Transfer of technology in order to encourage the use of new technologies will assume particular importance and will include certain demonstration projects with particular reference to use of such standards. There will be no financing of product development.

The principal instrument of the specific programmes remains the shared-cost action, without ruling out the possibility of adjusted rates of support. In those cases where coordination of existing research activities at national level is the predominant aspect, concerted action will be used. The other methods of implementation provided for in the Treaty may be used, in particular to establish or strengthen links with long-term EUREKA projects meeting the criteria for Community action.

The Joint Research Centre is to participate in the implementation of the Framework Programme in those fields where it has the necessary competence. These are *inter alia* industrial and materials technologies, research with a prenormative character, nuclear safety (fission and fusion), technological forecasting, the environment and industrial risks.

The research, development and innovative capacities of small and medium-sized undertakings, higher education establishments and research centres will be given sustained attention and their activities in partnership will be encouraged. Particular attention will be given to promoting the access of small and medium-sized undertakings to Community programmes.

Emphasis will also be placed on the various courses of action on fundamental research geared to any area where it might become necessary.

The Council will define the detailed arrangements for the dissemination of knowledge resulting from the specific programmes and other arrangements for implementing the Framework Programme. Within this legal framework, dissemination activities will be coherent and

coordinated, which presupposes on the one hand a central level of management and on the other freedom of action in specific programmes to organize a level of specialized dissemination. In both cases, such activities may be carried out in particular through publications or by computerized means according to common standards and protocols.

The activity of dissemination will also cover information on Community programmes and actions to provide easier access to information for small and medium-sized undertakings and private and public research laboratories. To this end, encouragement will be given to the creation or extension of the activities of national and regional relay centres for the dissemination and exploitation of results.

As far as the exploitation of results is concerned, although it is clear that in the first place it is the responsibility of undertakings and laboratories, in certain cases it requires Community action, coordinated with the operators concerned and the competent public or private organizations in particular at national or regional level (including *inter alia* the above relay centres), in order to protect certain results and facilitate and guarantee the best possible innovation transfer.

Both for the dissemination of knowledge and for the exploitation of results, it is necessary to specify or define the rules concerning intellectual and industrial property and the exploitation of the results within the Community and to observe them.

In addition to the evaluation activities involved in the various programmes, work on the methodology of evaluation, forecasting and strategic analysis will also continue unabated in cooperation with the Member States with a view to improving the effectiveness of Community research.

In strict accordance with the guiding character given to the Framework Programme by the Treaty, the following paragraphs make reference to the strategic elements of the 1990-94 Framework Programme.

I. Enabling Technologies

1. Information and Communications Technologies

The development of the relationship between information and communications technologies, the increased requirements of users regarding standardized systems and trans-European services networks to assist in unifying the European area and the strengthening of scientific and technological bases lead work on information and communications technologies to be directed in three main ways. An essential aim is to achieve open standards making it possible to improve the integration of advanced systems into the networks. In all the areas concerned, the active participation of users and small and medium-sized undertakings and the transfer of technology to their advantage will be encouraged.

A. Information Technology

Whilst ensuring that all the work relating to information technologies remains focused in the pre-competitive area, the emphasis will be placed, on the one hand, on demonstration activities for the preparation and validation of standards and for the integration of technologies and, on the other, on basic research, in particular in sectors which have the potential to make a substantial impact on industrial innovation, such as the cognitive sciences. In addition, activities on topics dealt with in the ESPRIT programme will be oriented towards the new generations of technologies. In a general sense, the balances between the various basic areas of technology defined in ESPRIT II (including those for microelectronics) will be respected.

The various activities envisaged may be grouped round four large fundamental topics which contain elements of continuity but also exhibit new facets in comparison with earlier research.

a. Microelectronics

The objective is to contribute, by means of precompetitive research and technological development work, to the strengthening of the European technological base in respect of semiconductors on which to base a European manufacturing capability for advanced products and the technologies for component processing. This work will also concern application-specific integrated circuits (ASIC), multi-function circuits, very fast circuits, optoelectronics, advanced power circuits (smart power), new equipment and materials for integrated circuits and, in conjunction with other initiatives in the Community such as JESSI (Joint European Submicron Silicon Initiative), the technologies linked to submicron silicon.

Research into and development of advanced and standardized computer-aided design tools for integrated circuits will also be pursued, particular attention being given to users' needs.

These actions will be organized in such a way as to link users and producers and encourage and ensure broad participation by operators in the Community as a whole, for the benefit of all.

b. Information Processing Systems and Software

The rapid development of this sector leads research to be directed towards parallel architectures, knowledge-based systems, workstations, hosts and distributed and real time systems. The tools and methods necessary to increase the productivity of the software and the integration of the systems will continue to be developed.

Emphasis will be placed on the portability of the software, re-usability and design of standardized modules and on prenormative research. Attention will also be given to seeing that European industry, in particular small and medium-sized undertakings, can adopt standardized software on a large scale and use the best

practices in the area of programming tools, methods and environments, taking account of national activities in this area.

c. Advanced Office Technology Systems and Peripherals

The main objective will be to use European technological competence to construct improved forms of architecture, software packages and other system components capable of adding to the value of devices and systems, in particular those based on standards.

The two main themes are research and development concerning the use of software engineering for the development of selective applications based on open standards and the integration of sophisticated information systems and interfaces. Among the fields concerned may be cited information systems adapted to mobile terminals, cooperation work (groupware), house automation and intelligent buildings and integrated data processing systems for business.

In this context, peripherals take on an added importance. The objective of research and development work is to reinforce the scientific and technological bases for new generations of peripherals which are reliable, cheap and capable of being produced in large quantities, without going as far as product development. This requires the use not only of basic technologies at the best state-of-the-art level, but also of new generic methods of manufacture. The action will have to lead, for instance, to new in-out arrangements and storage systems.

d. Computer-Integrated Manufacturing and Application of Information Technology to Industrial Engineering

The objective is to provide, by means of precompetitive research and technological development work, the bases for open, multisite and multi-vendor systems. The work will cover planning and scheduling systems, production control, computer-assisted engineering systems, robotics and quality-guarantee technologies. The areas concerned are those of discontinuous, continuous and batch manufacture, flexible assembly and mass production. Technology transfer activities will comprise some demonstration projects in which information technologies occupy an important position and which may be launched in real industrial environments enabling standards to be validated and their use to be promoted. These activities will be carried out in close coordination with those under heading 2.

This action will contribute to better integration in advanced systems of design and computer-assisted production of the needs voiced by industrialists including problems of work integration and organization and job evaluation.

B. Communications Technologies

The principal objective is to enable the integrated broadband network to take on the emerging new services, constructed on "open" standards, and to make the use of integrated services both flexible and cheaper.

Parallel to the continued development of the integrated broadband network and the strengthening of the research effort on optical communications and techniques of synchronic/asynchronic switching, the new activities will be directed towards the development of intelligent, reliable and secure networks and new value-added services that are both profitable and adapted to the developing needs of users. These actions include a Community R&D effort of the prenormative type in order to guarantee the interoperability of the systems on the basis of common standards and protocols.

Particular attention will be given to the growing demand for mobile telephony services and the integration of these services into networks.

The following actions are planned:

- **Development of intelligent networks.** Using new techniques of information transfer, optical communications and possibly artificial intelligence. The objective is to enable second-generation systems to exploit foreseeable progress in data processing. This requires research and technological development work in the fields of standardization and interconnection protocols. This work should take into account the development of a new European regulatory environment on open architecture (ONP—Open Network Provision).
- **Mobile communications.** The objective is to contribute to definition of the standards necessary for the third-generation system which should appear on a time-scale of 1996 and beyond and permit the exploitation of new hyperfrequencies in mobile telecommunications services.
- **Image communications.** Building on numerical image transfer (including high-definition television—HDTV), research efforts are needed into processing, storage and display to integrate image into multimedia communications and to ensure the development of allied protocols and coders-decoders.
- **Service engineering.** Work of a prenormative type on architectures and software, realized on basic teleservices and on improved value-added services, with particular attention to their ease of use by small and medium-sized undertakings and preparing the scientific and technological bases for development of standards both for systems and for telecommunications services.
- **Experiments in advanced communications.** It will be necessary to identify the characteristics and functions of certain advanced model services. These experiments of a generic kind, in real conditions, will contribute to developing interconnection standards and to verifying the feasibility of integrated communication systems so as to limit the dangers when they are introduced later.

- **Security of Information.** The objective is to contribute to the development of technologies which can guarantee effective and practical security meeting the requirements of interconnected or integrated communication services used by economic operators and by the general public. Priority research and technological development work is required to contribute to the definition of international standards and verification technologies.

C. Development of Telematic Systems in Areas of General Interest

The general objective consists, by means of prenormative research and a limited number of experimental development activities concerning the validation of common functional specifications, in ensuring the interoperability of systems, peripherals and telematic networks at trans-European level. Special attention will be given to considerations of quality, reliability, security and ease of use of services, and to economies of scale and the abolition of barriers to information exchange.

The work will be carried out in areas corresponding both to requirements resulting from the implementation of the large European market and the new increased requirements of a social and economic nature which can both benefit from the use of new telematic resources.

The realization of the large internal market is setting new requirements in the field of services and information exchange. In relations between public administrations, new requirements are being expressed, for instance, in the areas of emergency services, justice, the social services, statistics, customs and the environment. Sectors of general concern are dominated by questions of transport, health, problems relating to the handicapped and aged, problems of training, problems of links between libraries and access to rural areas.

To meet these requirements, beyond the efforts being undertaken within regional or national contexts, an additional Community effort is also needed in research and technological development.

Most specifically, some of these sectors have already been explored in the course of exploratory activities (AIM [Advanced Informatics in Medicine], DELTA [Developing European Learning Through Technological Advance], DRIVE [Dedicated Road Infrastructure for Vehicles Safety in Europe]) or preliminary activities (investigation of needs in rural areas and libraries). The planned research and technological development actions will be based on the experience and results obtained from these exploratory actions. Endeavours will be made to achieve their continuity so as not to lose the advantage of the community of interest created.

It will only be possible to develop such projects fully outside the Framework Programme: The setting-up and exploitation of networks and services are not covered by this work.

In each of the above two areas, making services easier to use will require a sustained effort in language research and engineering. Following work already done as part of the Eurotra programme, it is now necessary to encourage the development of operational systems linked to information and communications systems.

All these actions will involve information and communications industries, telecommunications operators, providers of telecommunications services and pioneer users of advanced communications. In the case of telematic services, the trans-European dimension will be even more necessary for success than elsewhere.

2. Industrial and Materials Technologies

The objective is to contribute to the rejuvenation of European manufacturing industry by strengthening its scientific base through research and development work. With that in mind it is important to encourage:

- basic technical research;
- integration of new technologies by user industries;
- acquisition of the scientific and technical knowledge needed in order to establish standards and codes of good practice facilitating the transfer of such technologies;
- harmonization of methods of measurements and testing.

The advanced technologies required cover the whole life-cycle of materials and aim at reducing the "design to product" lead time and improving manufacturing processes. In selecting actions to be implemented, account will be taken of the experience acquired through current programmes and pilot projects (BRITE-EURAM [Basic Research in Industrial Technologies for Europe - European Advanced Materials Program], Raw Materials, Recycling, and BCR [EC Reference Bureau]).

These technological developments will integrate considerations of future market requirements and more severe constraints as regards the environment and working conditions, while at the same time enabling improvements to be made in the competitiveness of European producers and users.

The more it can be guaranteed that technologies will have a human dimension, the more the quality of work and consequently the quality of production will increase. Work will therefore cover research and development concerning the working environment and continuous adaptation of the skills of workers to technological change. New methods of management and organization will be sought in order to ensure a smooth relationship between technology and the working world.

Work carried out in any of the three areas described below will be linked to the others and consequently not performed in isolation, but under a systematic approach. Research on new materials will be closely linked to research on the design and manufacturing processes needed to make economic use of the materials and

prenormative research allowing the incorporation of such materials into products and ensuring environmental acceptability.

The research work proposed will help to consolidate and further technological developments within the Community and make more effective use of resources. A particular effort will be made to help small and medium-sized undertakings become more involved in transnational research, develop links with other undertakings and universities and manage their technical resources better.

Research on measurements and testing is necessary to the application of harmonization of quality standards and testing methods and the acceptance of results throughout the Community. Greater collaboration between laboratories will improve the quality of results and their acceptability, as called for by the completion of the single market.

This approach concerns both the following areas of activity and their interfaces:

A. Materials—Raw Materials

The objective is to contribute to improving the performances of materials at a cost which permits competitive industrial exploitation over a broad range of applications not restricted to a few high-performance items. The aim will be to promote an integrated approach to the whole life-cycle of materials, including recycling.

The activities in question will concern both research on advanced materials for key applications, which may have important spin-off effects in other areas, and research on traditional materials of broader application, such as are used in the construction industry where improvements to the materials life-cycle are needed.

Emphasis will be placed on research enabling innovative uses of materials, metals and industrial minerals, and on their production and processing, including exploration, recovery and recycling.

There will also be strong encouragement to undertake basic research and exploit emerging and rapidly-developing technologies.

Particular attention will be paid to research into new materials to improve understanding of their structures and properties, including the production cycle.

B. Design and Manufacturing

The objective is to reduce the "design to product" lead time and to improve the means, processes and management of design and manufacturing operations, on the basis of the state of the generic technologies concerned.

Emphasis will be placed, *inter alia*, on quality, reliability, the control of products and processes, and on the research and technological development work needed for the adaptation of computer-aided design and manufacturing techniques, especially for small and medium-sized undertakings. Care will be taken to ensure close coordination of this activity with the generic aspects of such design and manufacturing techniques covered by heading 1.

The development of the technologies necessary for the modernization of European industry requires a basic research effort, in particular in the areas of physics and chemistry. Similarly, recourse will be had at the same time to generic disciplines (such as mathematical modelling, acoustics, fluid dynamics, process engineering, etc.) and new technological developments (concerning, for example, surface treatment, miniaturization, optomatronics, etc.).

C. Measurement and Testing

The objective is to lead, by means of improved harmonization of methods of testing, measuring and analysis, to the elimination of certain obstacles to trade in the large internal market.

To that end, transnational actions will be undertaken in four main fields: establishing the scientific and technical bases for Community regulations and directives concerning measurements (including exploitation of research results concerning instrumentation), testing and analysis; the resolution of such sectoral testing problems as might arise when an international approach to certification and testing is adopted and implemented; work arising out of a coordinated approach to the provision of measuring standards adopted henceforward in the Community; and support for the development of new methods of measurement.

The drawing up and implementation of standards and codes of good practice, which are necessary to meet the requirements of the market and which require prenormative research and development work, will be guaranteed by means of the research programmes concerned and are covered by other lines of activity.

In carrying out the research outlined above, flexibility of means of action will be particularly important. Two notable means of implementing these proposals will be:

- Technological stimulus and cooperative research action to extend current initiatives—an open arrangement, without any constraints of theme or timetable—will be set up to support particularly innovative technological projects which, at any given time, could not be included in the other actions. This will help in particular to solve technical problems common to groups of small and medium-sized undertakings without research facilities of their own. This activity is defined in relation to the other sections of the programme as meaning that as a general rule only small and medium-sized undertakings can be considered, in conjunction where appropriate with research centres, with a view to increasing their involvement in Community research programmes.

- While maintaining the generic approach followed under this heading, selected integrated projects will be considered in appropriate fields where a range of generic technologies need to be brought together with a view to providing users with a definition of operational specifications. These projects will have specific targeted objectives, bringing suppliers and users together in a systematic approach and at the same time facilitating the participation of small and medium-sized undertakings. Product development and commercialization will be a matter for the competent industries.

In view of the needs created by the setting up of the large internal market, the fields to be considered here would include, for instance, transport (which may be the subject of integrated activities concerning, for example, the aeronautical industry—after evaluation—the motor industry and the "clean car"). The logistical aspects of harmonization and standardization of means of transport will also be given special attention in conjunction with the activities under heading 1. Other fields will be likely to benefit from an integrated approach.

In general, all these actions will have to contribute to the emergence of European small and medium-sized undertakings, in particular by encouraging their integration in the technological networks developed at that time.

The Joint Research Centre will contribute to these activities via work on advanced materials which gives priority to the prenormative aspect, the preparation of nuclear and non-nuclear reference materials, the acquisition of reference data and the validation of certain reference techniques.

II. Management of Natural Resources

3. Environment

Here the purpose is to develop the scientific knowledge and technical know-how the Community needs in particular to carry out its role concerning the environment, as spelt out in Title VII of the EEC Treaty.

In this sector, the research activities are directed towards an undertaking of the fundamental mechanisms of the environment, identification of pollution sources and assessment of their combined effects on the environment. They will contribute to the preparation of quality standards, safety and technical standards and the working out of methodologies for environmental, health and economic impact assessment, and will also be geared towards the prevention of natural and technological hazards and towards rehabilitation of the environment. In addition to these activities, "horizontal" aspects of the environment will be taken into account in the various courses of action.

A. Participation in Global Change Programmes

The objective is to contribute to understanding of the processes governing environmental change and to assess the impact of human activities. Community participation will be concentrated on problems which will have an impact on environment policy and in areas where the Community is best placed to ensure European coordination in the framework of large international programmes while taking account of national programmes. This participation will contribute to the development of research on natural and human-induced climatic change; the interaction between biogeochemical cycles, atmospheric physics and chemistry; effects on ecosystems; physical, chemical and biological oceanography and climatic processes in general, as well as the depletion of the stratospheric ozone layer.

B. Technologies and Engineering for the Environment

The objective is to promote better environmental quality standards by encouraging technological innovation at the pre-competitive level. The two main lines of research in this field will be environmental monitoring, including remote sensing applications and the development of techniques and systems to protect and rehabilitate the environment (for example recycling, treatment of toxic wastes, of contaminated soil and of waste water, and clean technology).

C. Marine Sciences and Technologies

In the areas of marine sciences and technologies, in addition to the MAST [Marine Science and Technology] pilot programme, a special effort will be made on basic know-how (including oceanography), coastal engineering and technologies for the exploration and exploitation of resources whilst respecting the environment.

D. Research on Economic and Social Aspects

The objective is to improve understanding of the legal, economic, ethical and health aspects of environmental policy and management, and concerns: natural and technological risk assessment, perception and management; the economic evaluation of environmental impacts; the socioeconomic impact of the implementation of environmental policies; and the effectiveness and consistency of laws and regulations related to environmental matters.

E. Integrated Research Projects

The objective is to cooperate on interdisciplinary research into a limited number of areas of transnational interest. These transnational projects may involve coordinated campaigns, extending from observation and experimentation to integrated operations attaching to all aspects of a regional issue and encompassing general research work on natural and technological risks. Integrated research into modelling will also have to make possible assessment of technological strategies for the environment. There will also be concerted action on the databank.

The Joint Research Centre (JRC) will contribute to activities in the environmental field, in particular by prenormative work on atmospheric chemistry and on

modelling, by study of the assessment and management of technological risks and by use of experimental ways of assessing such risks. The JRC will make a specific contribution to the application of remote sensing techniques in cooperation with the European Space Agency; in cooperation with the future Environment Agency of the European Community, it will contribute to the development of new instruments and trial techniques, to the harmonization of methods of measurement and to intercalibration.

4. Life Sciences and Technologies

The long-term strategic objective is to contribute in a selective and integrated way to the development of Europe's potential for understanding and using the properties and structures of living matter.

A. Biotechnology

The aim of this research is to reinforce basic biological knowledge as the common and integrated foundation needed for applications in agriculture, industry, health, nutrition, and the environment.

All the necessary importance will be attributed to the ethical implications of such work and their relevance to industry.

The goals of the BRIDGE [Biotechnology Research for Innovation and Growth in Europe] programme will be expanded. The priority areas will include protein structure and function; molecular modelling; the structure and function of genes, in particular genome analysis in representative species; the conservation of genetic resources; the expression of genes and controls thereon; cellular regeneration and development; and the reproduction and development of living organisms. Work will also cover animal and plant microbe metabolisms and their essential physiology, and the ecological implications of biotechnology, with particular reference to microbe ecology and the environmental behaviour of modified genes and organisms. Communication systems within living matter, in particular immunology, neurobiology and the operation of receptors, will also be studied.

The methods and tests making up the requisite scientific prenormative bases for the preparation of Community rules will be developed.

B. Agricultural and Agro-Industrial Research

The objective is to contribute to securing a better match between production of land and water-based biological resources and their use by consumers and industry. Within the pre-competitive field, sights should be set on upgrading and diversifying agricultural and sylvicultural products, on enhancing the competitiveness of agricultural and agri-food undertakings in line with other Community policies, while contributing to better rural and forestry management and to ensuring proper protection for the environment.

These will involve interdisciplinary projects which make use in particular of the findings of biotechnology and take account of genetic factors, agricultural and sylvicultural engineering, cultivation or breeding techniques, and environment-plant interaction. In particular, there will be a project to develop effective remedies for desertification and deforestation. Research in the field of aquaculture and fisheries will be pursued.

Work has already started on some topics in the Second Framework Programme, especially under the ECLAIR [European Collaborative Linkage of Agriculture and Industry Through Research] programme. Still within the pre-competitive field, they will be supplemented by demonstration projects jointly developed by producers and users to bring the products of research and development closer to their applications.

In the field of industrial uses for agricultural and sylvicultural raw materials, still within the pre-competitive sphere, research must as a matter of priority be directed to innovative processes aimed at industrial exploitability of the by-products of food-oriented applications and at developing new, cleaner industrial and energy applications holding out favourable economic prospects.

Agri-food research already begun under the Second Framework Programme, in particular the FLAIR [Food Linked Agro-Industrial Research] programme, will be amplified, particularly as regards: definition and satisfaction of nutritional needs, toxicology and food hygiene, new technologies for agri-food processing. Further work in these sectors will take account of ongoing programmes (ECLAIR, FLAIR, agricultural research and fisheries).

When these projects are being implemented, encouragement will be given to the execution of innovative projects by small and medium-sized undertakings.

C. Biomedical and Health Research

The chief objective is to contribute to improving the effectiveness of research and development in medicine and health in the Member States—in particular through better coordination of their research and development activities—to applying their findings through Community cooperation and to using available resources in common.

The main focus is on new approaches to tackling economically and socially significant diseases (in particular cancer, AIDS, cardiovascular disease and mental illness), ageing, the problems of the handicapped and the problems of health at the workplace, through harmonized methodological and protocol studies in epidemiological, biological and clinical research. Activities will also cover the analysis of the human genome and will be closely coordinated with work done elsewhere on the other genomes. Ethical, social and legal aspects of implementing the findings of research into the human genome will be carefully assessed.

This action will be supplemented by pre-competitive research into ways and forms of administering medicines.

Particular attention will be paid to methods of early screening for risk factors, to the development and assessment of prophylactic and therapeutic methods and to the management of health services.

D. Life Sciences and Technologies for Developing Countries

The objective of this programme is to increase cooperation in the fields of tropical agriculture (including fisheries), medicine, health and nutrition between European scientists and scientists from developing countries so as to enable the developing countries to benefit from the scientific knowledge and technological developments available in the Community and to encourage the development of their own research capacity and the Member States of the Community to increase their own capacities.

All the problems associated with tropical areas (soil, water, forests, energy, environment, agriculture, population, health, nutrition, etc.) will be taken into account.

In tropical agriculture, emphasis will be placed on integrated management of agricultural resources, including aquaculture and forestry, for reducing food shortages in regions at risk while conserving the environment with due regard for the human factor. Special attention will be paid to crops which are potential substitutes for those used for producing narcotic drugs.

Tropical medicine research will undertake new initiatives on major health problems, particularly as regards transmissible diseases and health care systems.

5. Energy

The main aim of Community action in this area is the development of sound, environmentally safe energy technologies designed to improve the Community's energy balance at reasonable expense within the large market. This will be pursued in the following three areas.

A. Fossil and Renewable Energy Sources, Energy Utilization and Conservation

The objective is to contribute to the development of new energy options that are both economically viable and more environmentally safe, including energy-saving technologies, by means of joint activities to assist Member States in this direction. In this connection, increased attention must be paid to work on those energy technologies which, despite their high potential and the fact that they have no adverse effects on the environment, particularly the climate, cannot be used under satisfactory economic conditions at present as this work cannot yet be fully funded by industry.

Activities will be concentrated in three interconnected areas: energy conservation, renewable sources and reduction of the adverse inmpact on the environment. As regards energy conservation, account will be taken of the leading role of fossil fuels in the Community's energy supplies. This will include work on improving technologies for economizing energy in all its uses, energy production from fossil sources using advanced technologies, in particular combined cycles, and suitable substitutes for conventional fuels in the transport sector. As regards the environmental impact of producing and using energy, in particular electricity, emphasis will be placed on reducing emissions of gases responsible for the greenhouse effect, including CO^2. R&D work in the field of renewable energy sources will be stepped up to bring it rapidly up to the level where it can make an optimal contribution to the Community's energy policy.

Research into modelling should also enable technological strategies relating to energy conservation and energy-environment interaction to be assessed.

B. Nuclear Fission Safety

The aim of this action is to continue the common endeavour to support Member States in the fulfilment of their responsibilities for regulating and protecting the environment.

Community action will foster a harmonized approach to safety by bringing together all the parties involved, thus reinforcing the prenormative dimension of research. A new impulse will be given by concentrating research on reactor safety with greater attention to passive technologies, radioactive waste management, decommissioning operations, intervention in a hostile environment, fuel elements, actinides and control of fissile materials. Radiation protection research will cover radiation from natural and medical sources, a better definition of the risks of low radiation doses and new technologies to assess quickly the radiological consequences of nuclear accidents.

The Joint Research Centre will participate in this action through work in the field of reactor safety, radioactive waste safety and management, the management and safety of fissile materials, nuclear fuel and actinides.

C. Controlled Nuclear Fusion

The long-term objective of the Community fusion programme is the joint creation of safe, environmentally sound prototype reactors. The immediate objective is the establishment of the scientific and technological base for the construction of an installation designed to achieve and study the ignition and prolonged combustion of plasma and related technological problems (Next Step). Accordingly, in order to achieve control of plasma in conditions close to those of the Next Step, the Council could decide, in the light of the evaluation, to prolong the JET [Joint European Torus] Joint Undertaking beyond the date currently planned. Work relating to the Next Step and the new systems will be continued taking

into account developments in ITER [International Thermonuclear Experimental Reactor] cooperation. Following assessment of ongoing actions, work may include the building of specialized equipment necessary for attaining the objectives of the programme. Some existing fusion devices will be phased out, having completed their experimental programmes. The present keep-in-touch activity with other approaches to controlled thermonuclear fusion, and particularly with intertial confinement, will be continued.

The Joint Research Centre will make its contribution by means of work on installation safety, support for NET and some basic work on materials. This work will be closely coordinated with that undertaken in the same fields in associations.

III. Management of Intellectual Resources

6. Human Capital and Mobility

The objective is to help increase the human capital in terms of research and technological development which the Member States will be needing in the next 10 years and to make optimum use of their scientific and technical infrastructure, paving the way for a genuinely European scientific and technical community. This action should provide Community added value of benefit to all Member States.

Unlike the preceding headings, which are to be organized in a thematic or sectoral manner, this action will be organized across the board, following a bottom-up approach, around two main strands: training and mobility of research staff, and the building-up of networks.

Increased mobility of research staff will enable more of them to spend a significant amount of time during their careers working in high-level scientific and technical establishments in other Member States.

Actions will be aimed chiefly at training young people embarking on careers in research and technological development (especially at postgraduate level) and may also cover other staff, at times when they need to acquire new specializations, particularly during retraining required to adapt to rapid scientific and technological change, and in exchanges and cooperation schemes which are to be maintained on a permanent basis.

The building-up of an infrastructure of networks under this action is of crucial importance for the achievement of the objectives of the Community's research and technological development policy in consolidating and complementing the structuring effects of thematic programmes.

The networks will bring together both public and private sector laboratories and research teams from the Member States, so that they can all benefit from the experience acquired by the best amongst them. They will particularly encourage interchange between different disciplines, the grouping together of several techniques and the extension of applications from one area to another.

The networks should extend to all the regions of the countries of the Community, particularly bearing in mind the special needs of peripheral regions and regions that are currently lagging behind. Highly-qualified scientific and technical potential will thus be built up in these regions.

The activities being carried out under the SCIENCE plan will be taken further. In addition to twinning between laboratories, encouragement will also be given to projects of the same type involving both applied and industrial fundamental research, grouping together institutions from several countries or bringing together national and Community initiatives.

The effects of such action will be increased by developing cooperation between laboratories and teams of research establishments (including the Joint Research Centre), undertakings and higher education establishments.

Account must be taken of demographic factors and of the research and training structures peculiar to the various States, to help each of them to acquire the best possible capabilities.

This will also involve encouraging special access to existing major scientific facilities and fostering consultations when future facilities are being planned.

All these schemes will cover the various branches of technology, the exact and natural sciences, including mathematics and the human and social sciences, which help to strengthen the scientific and technical base of European industry and make it internationally competitive. Interfaces between basic science and technological applications will be taken into account.

Care will be taken to see that these activities have due regard to the existing bilateral and multinational cooperation to which the Member States are party, including cooperation in the COST framework.

Care will also be taken to see that they are in keeping with other Community training and research activities.

The scientific, technical and industrial community will be involved in implementing this project, particularly in identifying networks and choosing beneficiaries, with due regard for the guiding principles of the projects and for Community added value.

ANNEX III

Selection Criteria

In general, Community research and technological development (R&TD) actions should be selected on the

basis of scientific and technical objectives, their scientific and technical quality and their contribution to the definition or implementation of Community policies.

A particular aim of Community R&TD shall be to strengthen the scientific and technological basis of European industry—including that of small and medium-sized undertakings—especially in strategic areas of high technology and to encourage it to become more competitive at international level.

Community action can be justified where it presents advantages (added value) in the short, medium or long term from the point of view of efficiency and financing or from the scientific and technical point of view as compared with national and other international activities (public or private).

The following criteria in particular justify Community action:

- Research which contributes to the strengthening of the economic and social cohesion of the Community and the promotion of its overall harmonious development, while being consistent with the pursuit of scientific and technical quality;
- Research on a very large scale for which the individual Member States could not, or could only with difficulty, provide the necessary finance and personnel;
- Research, the joint execution of which would offer obvious financial benefits, even after taking account of the extra costs inherent in all international cooperation;
- Research which, because of the complementary nature of work being done nationally in part of a given field, enables significant results to be obtained in the Community as a whole in the case of problems whose solution requires research on a large scale, particularly geographical;
- Research which contributes to the achievement of the common market and to the unification of the European scientific and technical area, and research leading, where the need is felt, to the establishment of uniform rules and standards.

ANNEX IV

Rates of Community Financial Participation

The rates of financial participation by the Community are as follows:

- Direct action will in principle be fully funded;
- Concerted action may receive a contribution of up to 100 percent of the costs of concertation;
- For shared-cost projects, the contribution will not normally be more than 50 percent. Universities and other research centres participating in shared-cost projects will have the option of requesting, for each project, either 50-percent funding of total expenditure or 100-percent funding of the additional marginal costs;
- For the implementation of the activities provided for in Article 2(2), the Council will decide for each individual case the details of the Community's financial contribution.

There may be no derogation from these general rules, except under the conditions set out in each specific programme.

EC Approves Dutch Aid to HDTV, JESSI

90AN0306 Brussels EUROPE in English 9 May 90 p 13

[Report: "EC Commission Approves Aid the Dutch Government Plans To Grant to Philips for Its Participation in HDTV and JESSI Projects"]

[Text] Brussels, 8 May (EU)—The European Commission has decided not to raise any objections to the subsidies (ECU 10.7 million and ECU 12.9 million) that the Dutch Government intends to grant to Philips for its participation in the EUREKA high-definition television projects (HDTV) and the Joint European Submicron Silicon Initiative (JESSI). The Commission finds that this aid is compatible with the Common Market.

The planned aid represents, in the case of HDTV, 36.8 percent of expenditure for research and development for the project (ECU 29.1 million) and, in the case of JESSI, 33.9 percent of this expenditure (ECU 37.9 million).

FRG, GDR: BMFT Funds R&D Network

90MI0214 Bonn WISSENSCHAFT, WIRTSCHAFT, POLITIK in German 18 Apr 90 p 11

[Text] The Association for the Promotion of a German Research Network [DFN], the Computer Science and Technology Institute at the Academy of Science, and Dresden Technical University have drafted a joint proposal to link the GDR's regional research centers to the FRG research network via computer dialogue and electronic mail. According to the Federal Research Ministry, Dresden Technical University represents the interests of the GDR universities and technical colleges in this joint project. The Institute of Computer Science and Technology is looking after the interests of the Academy of Science and its facilities. The DFN association, a self-help science organization with headquarters in Berlin, which has set up a research communications pool in the Federal Republic with BMFT [Federal Ministry of Research and Technology] support, has now offered the GDR institutes assistance in setting up a computer network compatible with the FRG communications pool. The joint project is designed to extend the DFN association's packet switching network into the GDR in

order to offer scientists there access to DFN communications services with the same performance characteristics as in the Federal Republic. The Federal Research Ministry is subsidizing the DFN association's cooperation project with about 1.5 million Deutsche marks [DM] to build up a pan-German research network.

JESSI To Stimulate Industry Involvement

90AN0234 Amsterdam COMPUTABLE in Dutch 2 Feb 90 p 11

[Article: "Interest in JESSI Is Disappointing—European Campaign To Stimulate IC Technology"]

[Text] Munich—An extensive campaign is to be launched throughout the EC to stimulate the interest of business and industry in the Joint European Submicron Silicon Initiative (JESSI) program. Industry's interest in participating in this program, which is aimed at strengthening the position of European integrated circuit (IC) producers on the world market, has up to now been lower than expected, especially as far as small and medium-sized companies are concerned.

In the Netherlands, the Foundation for a Microelectronics Center (SCME) has been appointed to launch such an awareness program. The aim is to disseminate knowledge already acquired within JESSI as much as possible. SCME will organize seminars, courses, and lectures, in particular for small and medium-sized users of chips.

In addition, assistance will be given those companies which want to make experimental production runs of application-specific IC's. Companies which have previously had little or no acquaintance with IC's will be offered the chance to gain some experience, in the hope that they will thus learn the art of chip design. This design process requires an accurate problem definition, since chips can only provide a solution if all user requirements received proper consideration.

Sematech

The SCME information program is one of the more than 20 new projects approved during a meeting of the JESSI management board in Munich on 30 January. At the same meeting, it was also decided to invite IBM Europe to take part in specific JESSI projects to which its vast know-how and enormous resources can make a substantial contribution. As a front-rank member of Sematech, the U.S. counterpart to JESSI, IBM is expected to function as a link between JESSI and Sematech. The JESSI board stressed that such cooperation between JESSI and Sematech is extremely important, since it would strengthen the position of both European and American IC manufacturers against competition from Japan, South Korea, and perhaps in the future, Taiwan. The short-term objective is to launch a series of activities which will concretize cooperation between JESSI and Sematech. The starting point must be the principle of reciprocity, whereby U.S. subsidiaries of European companies must be allowed to join Sematech to the same extent as U.S. companies such as IBM are taking part in JESSI.

Cooperation

One basic requirement is that cooperation between JESSI and Sematech should lead to greater standardization. Compatibility of chip manufacturing equipment is a major objective. This can be achieved by closely coordinating the two independent projects. It is therefore necessary that there be a link between JESSI and Sematech.

Additionally, nine projects from the subprogram on "Equipment and Materials for IC Manufacturers" received official JESSI status last week. This section of the JESSI project is crucial for the creation of an efficient, independent European IC industry. The JESSI board is afraid that major IC factories will overlook European manfacturers as suppliers of equipment and materials if they do not cooperate, despite the great number of individual projects already in the pipeline.

Philips, too, received the go-ahead for a number of projects, the most important one being that on the development of logic circuits using submicron technology. Another Philips project which was approved involves the development of a mass-production technique for the manufacture of highly advanced chips of good quality. This project aims to provide chip manufacturers more control over the production process. Chip production involves more than 300 different steps requiring extreme accuracy. Problems are most likely to occur in this stage, which will consequently receive extra attention. Philips scores equally well as far as applications are concerned: JESSI status has been given to the Digital Audio Broadcasting project for the production of digital radio broadcasts and to another Philips project for the development of a scanning electron microscope to scan chip surfaces with a view to testing operations. The official name of this project is "In-Line Metrology."

Philips is not only involved in JESSI via its components division but also through its systems houses. This rather obscure term refers to Philips divisions which specialize in specific IC applications, for example the consumer electronics, telecommunications, and computer divisions. These systems houses must bring systems onto the market such as high-definition television (HDTV), in which application-specific IC's form a central part. As an IC manufacturer, Philips anticipates the development of 1-megabit static random access memories (SRAM) in 0.7-micron technology before the end of this year, 4-megabit SRAM's in 0.5-micron technology by 1993, and 16-SRAM's in 0.35-micron technology by 1996. There is thus an innovation cycle of about three years. Philips will concentrate on static RAM's, whose main use is in portable audio and video equipment.

COMPUTERS

GDR: Basic Configuration of EC 1834.01 Computer Described

90WS0007A East Berlin RECHENTECHNIK-DATENVERARBEITUNG in German Feb 90 pp 2-6

[Article by Gerold Deutsch and Ulrich Baehring of the "Ernst Thaelmann" VEB Robotron Office Machines, Soemmerda; and Horst Niepel and Frank Espig of the VEB Robotron Accounting Machines Factory, Karl Marx Stadt: "Basic Configuration of the EC 1834.01"]

[Text] The EC 1834.01 personal computer is an enhanced design based on the EC 1834 and incorporates user suggestions, new components made in the GDR and new CEMA components. Its main features are:

- assuran of functional compatibility through adaptation of the DMA process, use of the DMA CM 637 chip (analogous to the i8237A) supplied by the People's Republic of Bulgaria, conversion of the 16-bit-wide CPU data paths to two 8-bit-wide paths on the system bus, provision of new compatible floppy and hard disk controllers
- use of the U61256 memory chip as the system memory
- provision of an accelerator card based on the fast U80600 16-bit microprocessor system for applications which require enhanced computing capability
- expansion of the range of I/O interface adapters for the connection of peripheral equipment to the computer, and for computer-to-computer links.

System Unit

The system unit forms the heart of the EC 1834.01, and comprises the following main components:

—system board with slots for eight expansion adapters, (K1810WM86 microprocessor, 640KB RAM memory (downsizeable to 256KB), 32KB ROM memory, connection of serial keyboard interface, connection of tone generator

—power supply for the EC 1834.01 with the following specifications:
Max. input power: 265 W
Line input voltage: 220 V +10%/-15%
Line frequency: 50/60 Hz
Secondary voltages: +5 V +/-3%
max. 20 A, min. 2 A +12 V +/-3%
max. 6 A -5 V +/-5%
max. 150 mA -12 V +/-4%
max. 200 mA

—two K 5601 floppy disk drives with controller (FDC/XT)

—K 5504.20 hard disk with controller (HDC/XT)

—video adapter for alphanumeric and/or graphics monitor

System Board

This model uses the same basic system board as used in the EC 1834 (RECHENTECHNIK-DATENVERARBEITUNG 2/88).

Technical Data and Components

- multilayer PC board, 240 mm x 360 mm
- K1810WM86 microprocessor (5 MHz)
- K1810WM87 math coprocessor (optional)
- clock frequency: 4.9152 MHz; K1810GF84 clock chip
- 32KB ROM memory (ROM BIOS), 4 U2764 EPROMs
- 640KB RAM, parity-checked, 16-bit-wide data path; 18 U61256s, 18 U6164s, downsizeable to 256KB
- DMA function group, 4 DMA channels, (prioritized), 3 channels available on the system bus, CM637 (i8237A-5) DMA chip
- bus cycles: 4 clock cycles (memory), at least 5 clock cycles (I/O)
- timers: 3 16-bit timers (KR580WI53)
- interrupt system: 6 interrupts available on the system bus, KR580WN59A interrupt controller with 8 interrupts; a second interrupt controller can be cascaded
- keyboard controller with EMR U8821M, serial protocol
- configuration switch (coprocessor, RAM size, monitor type, number of diskette drives)
- 8 expansion slots with up to 6 indirect SL-R96-332 EBS GO-4007 connectors and up to a maximum of 4 62-pin direct connectors

The following function changes were made with respect to the EC 1834 (RECHENTECHNIK-DATENVERARBEITUNG 2/88):

RAM Memory

The use of 18 256KB DRAMs and 18 64KB DRAMs allows the 640KB system memory to be accommodated on the system board. This makes an additional expansion slot available. As with the EC 1834, the 384KB RAM expansion board can be used for

- expanding the downsized version of the system memory (256KB) to 640KB on the system board
- background memory (RAM disk) via programmable bank switching. The switching logic for this application is located on the system board.

Interrupts

The use of a KR580WN59A interrupt controller makes available 8 prioritized hardware interrupt levels which are allocated as follows in the EC 1834.01:

0 Time-of-day clock 1 Keyboard 2 KIF adapter, or for cascading 3 Serial port 4 Serial port 5 Hard disk controller 6 Floppy disk controller 7 Parallel port

The use of a second interrupt controller is made possible by cascading via IR2. This makes available 15 prioritized interrupt levels. The KIF adapter interrupt is then IR9.

DMA System

The Bulgarian CM637 (i8237A-5) DMA controller is used to control the DMA system. It allows a fast data transfer rate between the system memory and the I/O devices. The DMA system supports exclusively 8-bit transfers between the associated I/O devices and the system memory. The maximum block length is 64KB.

DMA transfer is initiated by a DMA request (DRQi) from an I/O device, and the associated acknowledgement signal (/DACKi). The DMA controller has access to the system bus until there is no longer an active DMA signal, or until TC = 0 has been reached. A processor interrupt is not supported. One DMA read/write cycle consists of 2 to 4 DMA clock cycles, depending on the programmed transfer mode and time conditions.

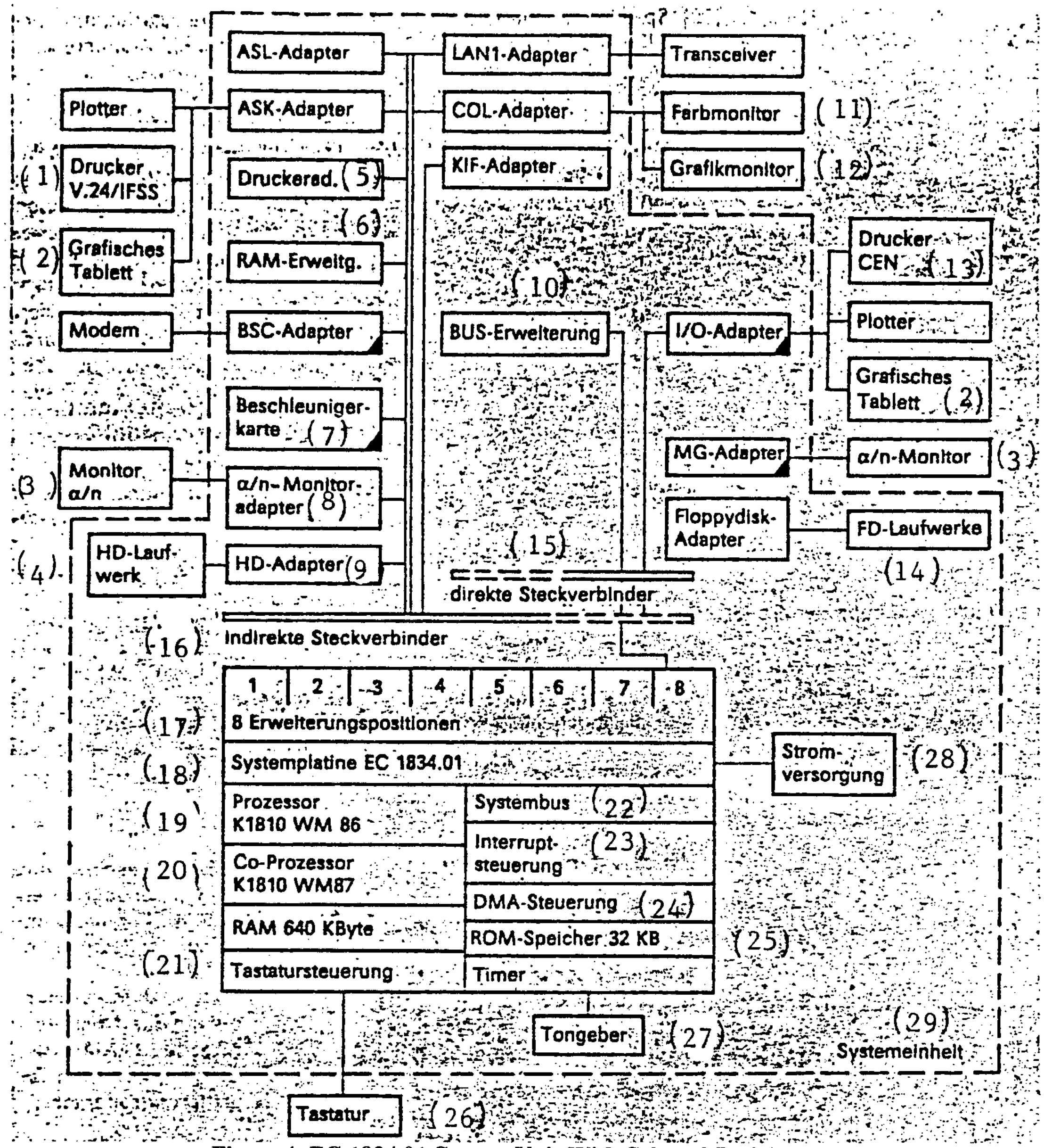


Figure 4. EC 1834.01 System Unit With Selected Peripherals

Key: 1. Printer V.24/IFSS—2. Data Tablet—3. Alphanumeric Monitor—4. Hard Disk Drive—5. Printer Adapter—6. RAM Expansion Card—7. Accelerator Card—8. Alphanumeric Video Adapter—9. Hard Disk Controller—10. Bus Expansion—11. Color Monitor—12. Graphics Monitor—13. CEN Printer—14. Hard Disk Drives—15. Direct Connectors—16. Indirect Connectors—17. 8 Expansion Slots—18. EC 1834.01 System Board—19. K1810 WM 86 Processor—20. K1810 WM87 Coprocessor—21. Keyboard Controller—22. System Bus—23. Interrupt Control—24. DMA Controller—25. 32KB ROM Memory—26. Keyboard—27. Tone Generator—28. Power Supply—29. System Unit

I/O Data Paths

In the case of 16-bit I/O access, byte-swap logic is generally used for conversion to two 8-bit paths on the system bus, as used in the 16-bit memory access configuration.

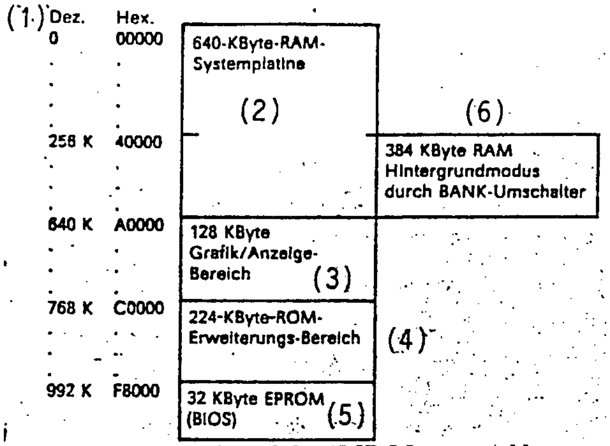


Figure 5. Allocation of the 1MB Memory Address Space

Key: 1. Dec.—2. 640KB RAM System Board—3. 128KB Graphics Display Area—4. 224KB ROM Expansion Area—5. 32KB EPROM (BIOS)—6. 384KB RAM Background Mode via Bank Switching

Keyboard

The EC 1834.01 personal computer uses the proven K 7673.xx flat keyboard which complies with international ergonomic and reliability standards.

The keys are divided into the following function groups:
- country-specific typewriter keyboard and typewriter control keys
- numeric keypad
- function and function control keys (assigned via software)
- cursor control keypad
- display area

Operation
- serial interface
- transfer of scan codes
- FIFO memory for 16 characters (scan codes)
- keys classified as make/break
- Typamatic function for all keys except pause key

Floppy Disk Controller

The floppy disk controller supports up to four 5 ¼ inch, 720KB [sic] MFM drives, and is controlled by the CPU and the DMA circuitry on the system board.

The controller has one or two edge connectors to accommodate two internal drives connected via special flat cables.

Disk Drive Interface

The signal inputs, in accordance with the technical requirements of the connected drive types, are rated at 1 k ohm at +5 V, thereby permitting interface cables of up to 1.5 m in length. These signals are fed to the DL014 receiver with Schmitt trigger inputs. All outputs to the drives are implemented via K155LA13 (7438) OC drivers. (See Fig. 4 for address space configuration.)

Identification Port

The read-only register differentiates between the EC-1834.01 (FDC/XT) and EC-1835 (FDC/AT) floppy disk controllers via bits 7 through 3. The following configuration applies to the AT-class floppy disk controller:
Bit 7 6 5 4 3 2 1 0 0 1 0 1 0 x x x
Use of the XT-class controller requires a different configuration.

Digital Output Register

This write-only register controls the motor, drive select and other control lines. All of the bits are cleared when the system is powered up.
Bit 0 0 Drive A 1 Drive B
Bit 2 0 Release FDC 1 Reset FDC
Bit 3 0 Interrupt and DMA inhibited 1 Interrupt and DMA enabled
Bit 4 1 Motor, drive A on
Bit 5 1 Motor, drive B on

When two diskette drives are connected, bits 1, 6 and 7 are unused, and remain 0 after switch-on RESET.

Floppy Disk Control Register

This write-only register provides the clock pulses for the basic operation of the FDC as well as for its read and write functions. It is not used in this adapter, and is continuously in the [not specified] state after switch-on RESET. This sets the data separator clock to a frequency of 8 MHz, the basic FDC clock to 4 MHz, and the write clock to 500 kHz.

Write Control

Write data are generally precompensated with a value of 125 ns in order to compensate for the peak offset when the diskette data are read.

Data Separator with Synchronous Counter

In this circuit, the read data are formatted and the data window signal required by the FDC is generated by a counter synchronized by the read data.

Connection of the Disk Drives

Only internal drives are supported. The system is designed particularly for drive K 5601. Drives A and B are connected via the flat cable attached to edge connector X1, and drives C and D are connected to X2. Drives B and D are connected to the ends of the two cables. The terminating resistors are left in place only for these two drives. All drives in the

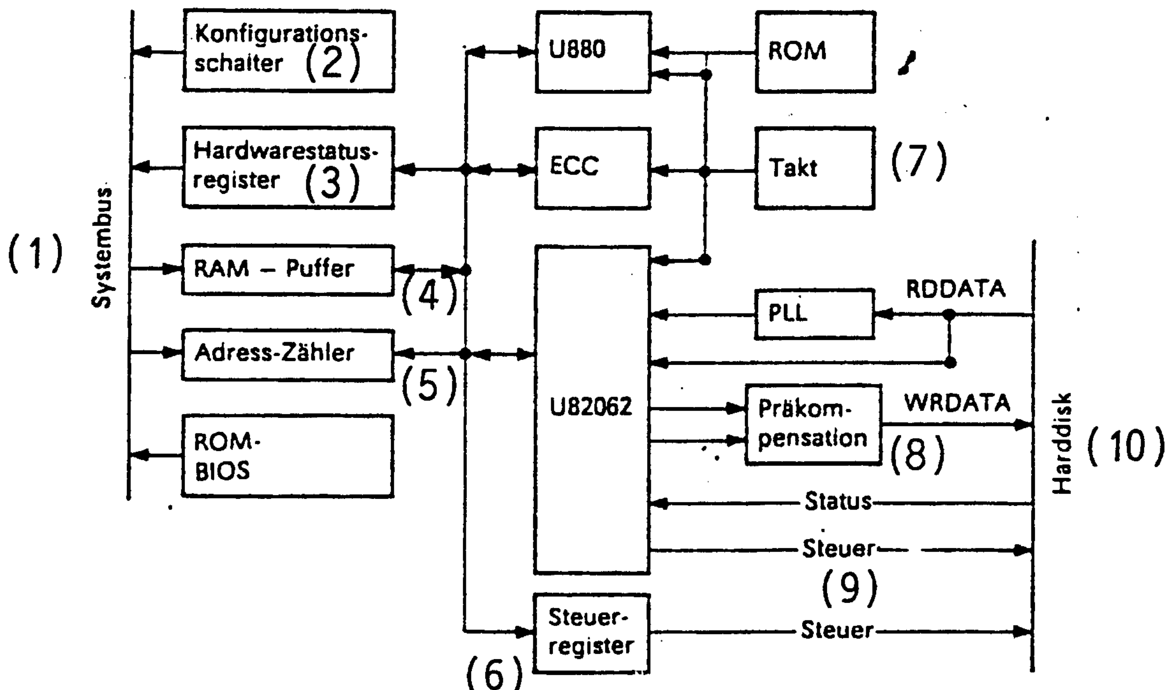


Figure 6. Block Diagram of the HDC/XT Hard Disk Controller

Key: 1. System Bus—2. Configuration Switch—3. Hardware Status Register—4. RAM Buffer—5. Address Counter—6. Control Register—7. Clock—8. Precompensation—9. Control—10. Hard Disk Drive

system are to be addressed at the drive end via DRIVE SELECT 1. Drive motor control is to be enabled at the drive via MOTOR ON.

Alphanumeric Monochrome Video Adapter and Monitor

The alphanumeric video adapter is designed for use with K 7228.1 and K 7229.24 or analog monitors. Main monitor features:

Image format: 25 rows of 80 columns each Resolution: 350 x 720 pixels Character size: 7 x 9 pixels in a 9 x 14-pixel matrix Horizontal frequency: 18.4 to 21.74 kHz Screen refresh frequency: 50 to 60 Hz Brightness and contrast controls Power consumption: <35 W Digital information inputs; video and intensity signals.

Fig. 7. Description of Function Groups

Address Space			
I/O	Read	Write	
Addresses (hex.)			
Prim.	Sec.		
3F1	371	identification port	
3F2	372		digital output register
3F4	374	main status register (FDC)	
3F5	375	data register (FDC)	

Fig. 8. Hard Disk Parameters

	K 5504.20	K 5504.50
Cylinders	615	1024
Heads	4	5
Precompensation	no	no
Write current reduction	no	no
Capacity (net)	20.9MB	43.5MB

Fig. 9. Adapter Address Map

Addresses (hex.)	Read	Write
320	read data	write data
321	hardware status	adapter reset
322	drive configuration	adapter selection
323	-	INT-, DMA-mask register

Fig. 10. I/O Address Map via Expansion Adapter

Addresses (hex.)	Device
000-01F	DMA controller (CM637)
020-03F	Interrupt controller 1
040-05F	Timer (KR580WN59A)
060-07F	Parallel port (KR580WN55A)
080-083	DMA page register

Fig. 10. I/O Address Map via Expansion Adapter (Continued)

Addresses (hex.)	Device
0A0-0AF	NMI register
0C0-0C1	Interrupt controller 2 (optional)
0E0-0FF	Reserved
11C-11F	Accelerator card (if installed)
1B0-1BF	KIF adapter (ESER connection, EC-7920 System)
1E0-1EF	Bank switching (RAM expansion)
210-217	Expansion unit (bus extension)
21C-21F	Accelerator card (if installed)
278-27F	Parallel port 2
2B0-2BF	Alphanumeric video adapter
2E0-2EC	Adapter for serial communications 2 (ASK)
2E8-2EF	Serial port 4
2F8-2FF	Serial port 2
31C-31F	Accelerator card
320-32F	Hard disk controller
378-37F	Parallel port 1
380-38F	BSC adapter 2
3A0-3AF	BSC adapter 1
3B0-3BF	Monochrome graphics adapter (MGA)
3D0-3DF	Color graphics adapter (COL)
3E0-3EC	Adapter for serial communications 1 (ASK)
3E8-3EF	Serial port 3
3F0-3F7	Floppy disk controller
3F8-3FF	Serial port 1

Fig. 11. List of Compatible Expansion Adapter Cards

Expansion Adapters	Number	Connection/Output
Floppy disk controller	1	drive K 5601
Hard disk controller	1	drive K 5504.20
I/O adapter	2	V.24, Centronics IF
I/O adapter expansion	2	V.24/IFFS, switchable
BSC adapter	1	V.24 synchronous
Accelerator card	1	
MGA adapter	1	text mode, b/w graphics mode resolution 720 x 348
RAM expansion	1*	RAM disk, RAM expansion of 256KB memory on system board
Printer adapter	1*	Centronics IF
Video adapter, alphanum.	1*	K 7229.24 & K 7228.1 monitors
KIF adapter	1	connection to EC7920 system
ASK adapter	2*	2 x V.24/IFFS, switchable
ASL adapter	1	2 x V.24/optical waveguide cable

Fig. 11. List of Compatible Expansion Adapter Cards (Continued)

Expansion Adapters	Number	Connection/Output
COL adapter	1*	K7233 color monitor, CGA mode (NMI emulation); resolution 640 x 480, special mode
LAN1 adapter	1	
Color graphics adapter (VGA)	1	under development
X21/X25 adapter	1	
Peripherals		
K 6313 printer	2	Centronics IF/I/O adapter
K 6314 printer		V.24 port
K 6327 printer		I/O or ASK adapter
K 6328 printer		
K 6416 plotter	1	V.24 port, I/O or ASK adapter
Sekonic SPL 430 plotter		ter
K 6405.20 data tablet	1	V.24 port, I/O or ASK adapter
K 7229.24 monitor	1	alphanumeric video adapter
K 7228.1 monitor		alpha video adapter, MGA adapter
Alpha 1 monitor		video adapter, MGA adapter
K 7233 color monitor	1	COL adapter, VGA adapter
K 7234.xx		COL adapter, VGA adapter

* The expansion adapters designed for the EC 1834 can also be used with this system. The original address range of the ASK and ASL adapters, the video adapters and the COL adapters is monitored, and when addressed by software they are emulated within the address range of the adapter in use by triggering the NMI (non-maskable interrupt). Simultaneous use of ASK and ASL adapters with the I/O adapter, as well as alphanumeric video adapters with the MGA adapter, is not supported.

The characters can be displayed with two levels of brightness. The monitors are connected via a 9-pin Type 121-9 EBS GO4006 connector. Selection of the required initialization parameters, the output stage type and the type of synchronization signals is made via a code in the monitor connector.

The image on the screen has the characteristics described above, including the following:

an attribute is assigned to each character

there are a total of 256 different alphanumeric and quasi-graphics characters

two character sets can be selected by software

the screen shows a blinking cursor

The adapter is connected to the monitor via five signal lines. Of these, the VIDEO 1 line transmits the display information for each pixel on the screen, while the signal on the VIDEO 2 line can be used to control the intensity of the display. The SYN line carries the synchronization

signal for the monitor screen. Monitors which use separate synchronization signals can also be connected to the system by routing the HSYNCDLY and VSYNCDLY signals to separate contacts.A U82720DC02 GDC (graphics display controller) is the heart of the alphanumeric video adapter. In addition to addresses in RAM and line numbers, it supplies the cursor, blanking, horizontal and vertical sync signals to the monitor. The refresh memory occupies 4KB of SRAM. It can be accessed via the GDC as well as directly by the CPU. The adapter supports two character sets, each of which comprises 256 characters.

The screen refresh memory, as part of the CPU address space, comprises 4KB and allows storage of a 25-line screen image of 80 characters per line, including the same number of character attributes. The character codes are stored in the even-numbered memory locations beginning at address B0000H, while the code for each corresponding attribute is stored in the next higher odd-numbered memory location. The user can switch from a standard character set to a second character set.

Hard Disk Drives and Hard Disk Controllers

Hard Disk Drives

The EC 1834.01 can accommodate a K 5504.20 or K 5504.50 internal hard disk drive (Fig. 5).

Both drives incorporate buffered seek operation, i.e., the 35 σ stepping pulses output by the controller are temporarily stored, and the optimum stepping rate for the drive is generated by the drive electronics itself. The conclusion of the seek operation is announced by the message *seek complete*. The interface signals from and to the drive are carried by a direct 34-pin connector, while a direct 20-pin connector carries the data lines.

Hard Disk Controllers (HDC/XT)

The powerful hard disk controller is used to operate one (or two, if the cable arrangement is upgraded) hard disk drives with a maximum capacity of 63MB. The hard disks must meet the following requirements:
SEAGATE ST506/412 interface
max. 1024 cylinders
max. 8 heads

The following options are supported:
precompensation from track 0 to track 1024
write current reduction from track 0 to track 1024

The controller is driven by a 1KB buffer which is responsible for exchanging data and commands. The exchange of commands is controlled by the CPU, and the DMA controls the exchange of data. The direction and content of the data exchange are determined by the controller CPU in the hardware status register. In addition, this interface can be used to poll the drive type, which can be configured by setting DIP switches (Fig. 6). This interface is compatible with the PC XT, therefore programs can be run on the system which program the controller directly rather than using the INT13 software interface.

To do this, the command set in the buffer is translated by a U880 CPU, and the U82062 hard disk controller chip is programmed. This chip controls the entire data exchange procedure which takes place between the hard disk and the buffer. A register which is controlled by the controller's CPU selects the hard disk and the read/write head. Parallel to the transfer of data in the buffer, an ECC character is generated and checked by a corresponding ECC generator. This 32-bit-long ECC character, which appears at each end of a data field, is used to ensure data integrity. In the event of a read error of up to 11 bits in length, the ECC characters can restore the corrupted data using a corresponding polynomial.

The data transfer rate to the disk drive is 5 Mbit per second, whereby the write data can be precompensated by +/-15 ns through software, depending on the drive type.

Due to the high data transfer rate, the data must be buffered sector by sector (one sector comprises 512 bytes). In order to take advantage of this high data transfer rate, it is recommended that the sectors be interleaved during low-level formatting of the drive. The degree of interleaving is determined by the interleave factor: For direct hard disk access, the interleave factor **3** is optimum, i.e. one track is read in three disk rotations. When operating the disk drive together with the DCP system, an interleave factor of **6** is to be used in order to achieve optimum computer speed. The controller incorporates an 8KB EPROM which can be addressed beginning at location C8000H. This EPROM holds the ROM BIOS of the hard disk controller which is accessed via INT13. This interface was previously described in the February 1988 issue of RECHENTECHNIK/DATENVERARBEITUNG.

GDR: Application of MIDOS Programming System Evaluated

90WS0043A East Berlin INFORMATIK in German No 2, Mar-Apr 90 pp 66- 67

[Article by Peter Kammer: "Experience With the MIDOS Programming System in the Transport System Using Different Computer Systems"]

[Text] The Science and Technology Information Center (IZWT) of the GDR Transport System's Central Research Institute is incorporated in the Transport System's Science and Technology Information System (IWTV). Within this framework the IZWT functions as

the central control station for information and documentation. We advise and provide guidance to our subordinate information/documentation control stations as well as recommend to them the use of specific software, including the MIDOS system.

The Transport System operates a "Central Data Bank of the Transport System." Operation of the large-capacity computer brings many advantages and cannot, as the international trend demonstrates, simply be dismissed in the foreseeable future. Nonetheless, information centers have criticized the time required before search results are available, the form in which the results are given, and the attendant costs. With the increased use of personal computers and other microcomputing technology, a demand also arose to use that technology in the Transport System to improve the efficiency of office and information work. The professional literature has made us aware of the various developments concerned with data acquisition and the execution of searches. In the Transport system as well, there were a number of programming developments, employing at that time the REDABAS system. Comparison of the published materials drew our attention to the MIDOS programming system.

The advantages of MIDOS can be summarized as follows:

1. MIDOS is a complex, self-contained system based on an integrated system, which was developed and continues to be developed by a single producer.

2. MIDOS is, as the name suggests, built on the modular principle. Changes in programming can be made without difficulty simply by changing modules.

3. The file and mask concept gives the user plenty of leeway to develop an individual system. MIDOS can therefore be used for other problems rather than simply for document verification processing. The Transport System especially values this flexibility.

4. MIDOS also permits a number of additional functions that enhances its attractiveness as a tool. Moreover, MIDOS 8 borrows from the POWER concept—to select file numbers for function triggering; in the case of MIDOS 16 the directory function by means of the bar cursor has proven very convenient and user-friendly.

5. MIDOS integrates numerous library functions. With but a single data collection, printing of title cards or compilations of lists produce a considerable rationalization effect. It is to be noted here that the title card product does not entirely correspond to the rules for alphabetic cataloguing and that has been criticized by some users.The developer is addressing this problem.

6. MIDOS is easy to learn, all information and error messages are presented to the user in understandable form. Help functions are available; documentation is clear and accurate.

7. MIDOS does not require any particular EDP knowledge on the part of the user; menu presentation and operator dialog are excellent.

8. MIDOS 16 was tested with respect to documentation creation and surpasses its predecessor in conveniences and performance.

The central data bank of the Transport System operates in a computing station on an EC 1056. Besides data acquisition, correction, and maintenance of information means, retrospective searches, bibliographies, and SIVs [selective information distribution] were produced as the result of the work. In the case of retrospective searches, the users are provided a large-capacity computer print out. SIVs and bibliographers are made available on magnetic tapes and printed via a converter.

In one of the first upgrading phases, these magnetic tapes were further processed with a I-100 computer, which produced the files separately and on 780-K diskettes. The second upgrading phase eliminated the need for conversion. The search results are given directly on diskettes in the computing station. Interested users work with pendulum diskettes. The result files are combined and further searched with MIDOS, as required. The end result is that costs for the large-capacity computer are saved, the output of redundant and irrelevant information is reduced, the resources are used many times, and, last but not least, the attractiveness of the information performance is increased by the user-friendly form of the output and the reduced execution times. Before us lies conversion to AIDOS VS., a system that realizes the dialog mode via terminals. Nonetheless, because of the costs and shortages, as well as availability, our partial resource technology will continue to exist.

Because of the previously discussed territorial and structural fragmentation of the Transport System, various 8- and even 16-bit computer technology, with accompanying time delays, came into use in the System's information stations. This made it almost impossible to get any information on the specific delivery situation and obstructed contractual relationships.

Roughly the following situation exists in the IWTV:

Of a total of eleven control stations for information and documentation (LIDs) and about 100 subordinate information stations (ISs), three LIDs and about ten ISs have their own microcomputer technology. Six LIDs and about 40 ISs use the technology in other fields, two LIDs and about 50 ISs have absolutely no possibility of conducting microcomputer-based information work. The spectrum of computing technology and specific experiences with the MIDOS system are as follows:

A 5120 Office Computer

We found the A 5120 office computer in two versions in our information offices—with the 1.2- and the 1.6- drives. In principle, this version ran without errors, however the 148-K- byte capacity was insufficient for

our needs. Therefore it remained the exception and we did not pursue it further. Work with the 1.6 drives, in which, depending on the operating system, 624- 800 K bytes storage capacity was realized, was more interesting. The copying or generation of partial files could be very conveniently be used with three drives.

PC 1715

MIDOS 8 could be loaded on the PC 1715 most often and with the least problems.

We tested MIDOS with the SCP-4, -5, -6 and CP/A operating systems. It operated most easily and with the most effective storage with the CP/A . But MIDOS works with all other operating system without problems (even with modified versions for special hardware changes).

A 7100

Many inquiries from our information offices are directed to the application of the A 7100. MIDOS 8 definitely cannot operate on this computer.

The SIM 1715 simulator was obtained by ZFIV [Central Research Institute of GDR Transport] from the VEB Tire Plant Fuerstenwald, which simulates PC 1715 programs on the A 7100 using a modified operating system of the SCP 1700. The MIDOS system could be called up, and the basic menu and some functions could be executed. However as soon as the result was supposed to appear on the monitor or diskette, the system crashed.

The EAW [input-output plant] helped us again with a modified MIDOS, and through tests and evaluating interviews an acceptable program version was developed. In principle, there is no difference in operating with this system as with the PC (only the function "change write protect" does not function), however the execution speed is greatly reduced by the simulation. To be sure, this occurrence falls within reasonable boundaries, but is clearly perceptible as compared with the PC 1715, particularly in displaying, printing, and loading new program modules, less so in searches. Since the performance of a 16-bit computer is not exhausted by such simulations, such solutions should only be viewed as transition versions. Nonetheless, before the appearance of MIDOS 16, this is the way it was done and is still being done, and not without success and in no way in a makeshift manner.

A 7150

Before the availability of MIDOS 16, the A 7150 presented a similar picture as the A 7100. From the forenamed simulator, a DCP version was delivered to us. MIDOS 8 could be handled without difficulty in the already modified A 7100 version—although here too with a considerably longer operating time. The possibility of using the fixed disk is an advantage. We generated a cold-start system diskette in such a way that by means of the CONFIG.SYS- and AUTOEXEC.BAT files an automatic start with loading of the drivers for the disks and SCP-drive is created. In this way, the possibility also exists to process SCP diskettes without difficulty as well. Theoretically the same evaluations of the work hold as in the case of the A 7100. This version too was successfully used in its day in the Transport System.

P 8000

Among other things, the P 8000 was planned in the ZLID as the replacement for the mentally and physically exhausting data collection technology. It also was convenient to look for a MIDOS application. Two possibilities exist:

1. The P 8000 is used as an 8-bit computer in single-user operation. This form was and remains out of the question for us, since at least five work stations have to be collecting data simultaneously.

2. By means of an SCP-emulator and the WEGA operating system, in which MIDOS is compiled and emulated on the P 8000, multi-user operation is achieved. To be sure, this solution works, but it is very slow (module loading is in the minutes range, i.e., much slower than with the A 7100), so that an adept, fast-writing data-handling capability would have problems. This version could be resorted to in an emergency, but it is in no way recommended.

PC 1715 W

To date, the PC 1715 W with the SCP operating system has rarely been used in the Transport System. The handling of MIDOS 8 (PC version) at first proceeds normally. The tool functions can be called up. The system has already miscalculated in the file allocation function, the help function could not be called up, and the system crashed during searches or when loading or unloading diskettes. Since the kind of errors resembled those of the A 7100, it was soon thought to test versions of MIDOS 8 that had been altered for simulation on the PC 1714 W. This attempt had positive results. To the present day, no restrictions on this version are known. In this way, the PC 1715 W also qualified for work with MIDOS.

A 7100/A 7150 with MIDOS 16

As has already been mentioned, our Institute had occasion, within the framework of industry trials, to test MIDOS 16 on an A 7150 under routine conditions. MIDOS 16 will certainly prove itself among users in the Transport System who have at their disposal an A 7150, a Schneider PC, or other DOS computers. However, because of the increased performance and better operating conveniences as compared with MIDOS 8, the Transport System would like to see it operate on other 16-bit computers as well. We were able to test MIDOS 16 successfully for the A 7100 by means of a DOS 7100 simulator put out by Humboldt University in Berlin. With but slight limitations, this program makes the A 7100 into a DOS computer. Besides MIDOS 16, other DOS programs are operating. The execution speed is not

measurably slower; the entire range of MIDOS 16 conveniences is useful. A single disadvantage is the lack of a fixed disk in the A 7100. We very much recommend this version to users who are employing MIDOS completely new.

Among all the named computer systems, MIDOS has proven its performance capability. Its employment in the information offices of the Transport System will certainly become more pronounced.

East German Optoelectronic Components Described

90WS0020A Prague SDELOVACI TECHNIKA in Czech No 3, Mar 90 pp 88-90

[Article by Vitezslav Striz: "RFT Optoelectronic Components"]

[Text] The stormy development of electronics and microelectronics has resulted in the intensive development and production of optoelectronic components which meet the new requirements of microelectronics, of state-of-the-art technology and top-flight equipment. The production of these components has required, on the one hand, development of modern production technologies and, on the other hand, close collaboration with customers.

The production program for optoelectronic components of the specialized VEB Television Electronics Plant in Berlin includes light emitting diodes [LEDs] with visible as well as infrared radiation, picture tubes with LEDs, silicon photodiodes, phototransistors, sensor elements, optoelectronic connectors, and color television tubes of the precision in-line type. Of the new components, we elect to describe the most interesting ones.

The Model SP114 Avalanche Photodiode

The Model SP114 Avalanche photodiode with a small photosensitive cathode area (0.038 mm^2) is characterized by a very low noise level and a highly amplified signal in the high-frequency range. It is slated for use in photoelectric sensor devices with a small or large sensing area, exposed to radiation through a flat glass window. The photodiode is manufactured on silicon by means of planar epitaxy.

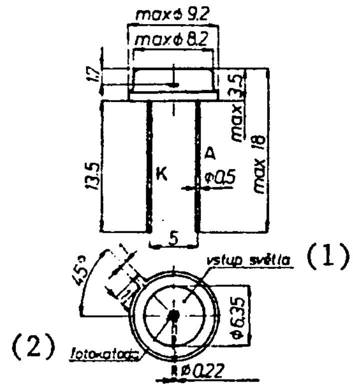


Figure 1. External view and principal dimensions of the SP114 photodiode

Key: 1. Light incidence area—2. Photocathode

The pin of the photodiode is located in a metal casing having two wire leads running through a glass package. The photodiode is covered with a glass window which is 6.35 mm in diameter. The external characteristics and principal dimensions of the casing are shown in Figure 1.

The photodiode operates at a high operating voltage in the range of 140 to 300 V with its maximum spectral sensitivity in the infrared range at 850 nm. Its spectral sensitivity is high— typically 0.4 A/W, the minimum guaranteed sensitivity is 0.3 A/W at a terminal voltage of 10 V. The broad-band amplifying product of 200 GHz predetermines that the photodiode Model SP114 will be used primarily in measuring, control, and regulating instruments for detecting high-frequency optical signals of low intensity.

The dependence of the multiplicative factor M upon the supply voltage used is depicted in Figure 2 [not reproduced]. Electrical characteristics of the photodiode are listed in Table 1.

Table 1. Electrical characteristics of Model SP114 Photodiode

Limiting characteristics (θ_a = 25° C)				
Rated power	P_{tot}	max	100	mW
Transition temperature	θ_j	max	125	°C
Operating temperature range	θ_a		-15 to +55	°C
Storage temperature (max 1 month)	θ_{stg}	-25 to +70	°C	
Characteristic Data (θ_a = 25° C)				
		type	min-max	
Limiting current with no incident light (E_e = 0 lx)	I_{RO}	1	<5	nA
Multiplication factor (I_p = 1 nA, λ_p = 850 nm[1])	M	200	>100	
Operating supply voltage (M = 100, I_p = 1 nA, λ_p = 850 nm[1])	U_{CC}		140 to 300	V

Table 1. Electrical characteristics of Model SP114 Photodiode (Continued)

Wideband amplification (λ_p = 850 nm)	VBP	2009		GHz
Equivalent noise level output (R_L = 100 kΩ, M = 50, f = 1 kHz)	NEP	10^{-14}		$WHz^{-0.5}$
Pulse rise time (R_L = 50 Ω, λ_p = 850 nm)	t_r	200		ps
Spectral sensitivity (U_R = 10 V, λ_p = 850 nm[1])	S	0.4	>0.3	A/W
Total capacitance (E = 0 lx, f = 1 MHz, U_R = 100 V)	C_{tot}	2		pF
Temperature coefficient of supply voltage (M =100, I_p = 1 nA)	TKU_B	+0.4		%/K
Series resistance, no incident light (U_B = 0 V, E = 0 lx, f = 1 MHz)	R_S	100		Ω

1. Illumination of photocathode over a large area.

SP213, SP215 Phototransistors

The planar NPN silicon phototransistors with an open base—Models SP213 and SP215—are intended for use in conjunction with GaAs infrared LEDs. Their spectral sensitivity is in the range of 800 to 900 nm. The phototransistor collector current is controlled by the intensity of the incident light upon the photosensitive area of the pin.

Both phototransistors have essentially the same electrical characteristics. The principal difference between them is in their photoelectric sensitivity, which is greater for Model SP215, and their incidence angles. The phototransistors are mounted in an all-plastic housing with a lens at the top of the package. The SP213 is 3 mm in diameter, the SP215 package is 5 mm in diameter. The external configuration and principal dimensions, along with the connecting leads, of the Model SP213 transistors, are shown in Figure 3a, that of Model SP215 transistors, in Figure 3b.

Model SP213 phototransistors are delivered unsorted or broken down into four groups according to the magnitude of the collector current. The sensitivities of the various groups are designated by color coding on their respective packages as follows:

Group	Color	Original designator
D	Red	SP213A
E	Black	SP213B
F	Green	SP213C
G	Yellow	SP213D

In their prototype series, the phototransistors were originally marked as Model SP213A through SP213D; now they are color-coded or marked with the letter designating the group following the original marking (SP213D).

Model SP215 phototransistors are characterized by a higher degree of photoelectric sensitivity and by a smaller angle of incidence. The remaining electrical characteristics are the same as those for Models SP213 and are listed in Table 2. The relative spectral sensitivity for both phototransistors is depicted in Figure 4 [not reproduced].

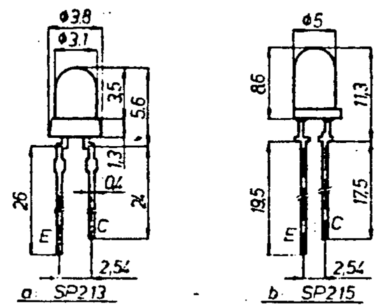


Figure 3. External dimensions and principal dimensions of phototransistors: a—Model SP213, b—Model SP215.

Table 2. Electrical characteristics of SP213 and SP215 Phototransistors

Limiting characteristics				
Collector-emitter voltage				
DC		U_{CEO}	max 50	V
Peak		U_{CEM}	max 50	V
Emitter-collector voltage				
DC		U_{ECO}	max 7	V
Peak		U_{ECM}	max 7	V
Overall rated power (θ_a = -40° C to +25° C)		P_{tot}	max 100	mW
Range of operating ambient temperatures		θ_a	-40 to +85	°C
Range of storage temperatures				
For long-term storage		θ_{stg}	+5 to +35	°C
For period of up to 30 days		θ_{stg}	-50 to +100	°C
Nominal characteristics (θ_a = 25° C)				
Collector-emitter current (E_V = 1000 lx, U_{CE} = 5 V)				

Table 2. Electrical characteristics of SP213 and SP215 Phototransistors (Continued)

Unsorted components	SP213	$I_{CE(H)}$	>1.0	mA
Group D	SP213D	$I_{CE(H)}$	1.0 to 2.0	mA
Group E	SP213E	$I_{CE(H)}$	1.6 to 3.2	mA
Group F	SP213F	$I_{CE(H)}$	2.5 to 5.0	mA
Group G	SP213G	$I_{CE(H)}$	>3.6	mA
Unsorted	SP215	$I_{CE(H)}$	>1.6	mA
Group E	SP215E	$I_{CE(H)}$	1.6 to 3.2	mA
Group F	SP215F	$I_{CE(H)}$	2.5 to 5.0	mA
Group G	SP215G	$I_{CE(H)}$	4.0 to 8.0	mA
Group H	SP215H	$I_{CE(H)}$	6.3	mA
Collector-emitter current; no incident light (E_V = 0 lx, U_{CE} = 25 V)		$I_{CE(-H)CEO}$	<100	nA
Angle of incidence	SP213	Theta	>40	°
	SP215	Theta	>30	°
Wavelength at maximum spectral sensitivity		$\Delta\lambda_{max}$	800 to 900	nm
Switching time				
Groups D, G, H		t_r, t_f	<20	µs
Groups E, F		t_r, t_f	<10	µs

Infrared Light-Emitting Diode—Model VQ175

The GaAlAs LED, Model VQ175, which radiates infrared radiation in the range of 830 nm is intended for use in optical transmission communications systems.

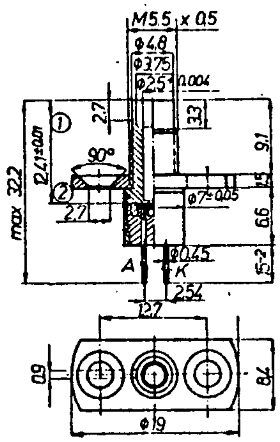


Figure 5. External configuration and principal dimensions of the VQ175 light-emitting diode

The diode is mounted in a metal housing, as shown in Figure 5, which is equipped with a hollow space for connecting the connector to the light source. It is possible to rapidly establish the connection between the diode and the connector and to disrupt it again; and that is why this component is suitable for installation in portable optical systems which are used for short periods of time. The anode and cathode of the diode are insulated from the housing.

The VQ175 diode radiates an output of a minimum of 25 µW at a current of 100 mA. The minimum continuous radiated power of the diode is 1 mW. The wavelength at the diode's maximum spectral radiation is in the range from 790 to 850 nm. The maximum bandwidth of the radiation is 50 nm. The diode can be operated in a broad range of operating temperatures from -40° C to +70° C. The overall electrical characteristics of the VQ175 diode are listed in Table 3.

Table 3. Electrical characteristics of the infrared VQ175 Diode

Limiting characteristics			
Cutoff voltage—direct current (θ_C = -40° C to +70° C)	U_R	max 2	V
Cutoff voltage—peak, periodic (θ_C = -40° C to +70° C)	U_{RRM}	max 2	V
Insulation voltage (θ_C = -40° C to +70° C)	U_{iz}	max 7	V
Forward DC current (θ_C = +50° C, TKI_F = -3.3 mA/K)	I_F	max 100	mA
Forward current—peak, periodic (θ_C = +50° C, TKI_F = -6.7 mA/K, t_{ip} = 10 µs, t_{ip}/T = 1:2)	I_{FRM}	max 200	mA
Transition temperature	θ_j	max +80	°C
Range of operating temperatures	θ_a	-40 to +70	°C
Range of storage temperatures (for periods of up to 1 month)	θ_{stg}	-40 to +70	°C
Nominal characteristics (θ_a = +25° C)			
Forward DC voltage (I_F = 100 mA)	U_F	<2.2	V
Tuned radiated power (I_F = 100 mA, d_k = 50 µm, d_K = 125 µm, NA = 0.2)	φ_{LL}	>25	µW
Continuous radiated power (I_F = 100 mA)	φ_O	>1	mW

Table 3. Electrical characteristics of the infrared VQ175 Diode (Continued)

Cutoff DC current (U_R = 2 V)	I_R	<10	μA
Duration of the leading edge of the pulse (I_{FRM} = 100 mA, t_{ip} = 1 μs, f_{ip} = 10 kHz)	t_r;	<30	ns
Duration of the pulse's trailing edge (t_{ip} = 1 μs, f_{ip} = 10 kHz, I_{FRM} = 100 mA)	t_f	<30	ns
Insulation resistance (U_{iz})	R_{iz}	>1	MΩ
Wavelength of maximum spectral radiation (I_F = 100 mA)	λ_p max	790 to 850	nm
Bandwidth of maximum spectral radiation (I_F = 100 mA)	$\Delta\lambda_p$	h[5]0	nm

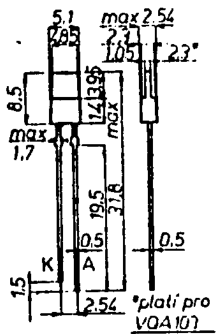


Figure 6. External configuration and principal dimensions of light-emitting diodes: VQA101, VQA201, and VQA301—photoemitting surface 1.05 x 4.85 mm; VQA103, VQA203, and VQA303—photoemitting surface 2.3 x 4.85 mm (marked with an asterisk)

Key: * Applies to VQA103

Models VQA101, VQA201, VQA301, VQA103, VQA203, and VQA303 LEDs

The RFT Enterprise of Berlin is expanding its already relatively diverse series of LEDs by two new series of diodes having a shaped light-emitting area measuring 1.05 x 4.85 mm for the VQA101 series and 2.3 x 4.85 mm for the VQA103 series. With the aid of these shaped diodes, it is much easier to create narrow or broader luminous strips. The configuration of both series of light-emitting diodes can be seen in Figure 6. The electrical characteristics of all diodes of both series are the same, with the exception of the color of the radiated light. The VQA101 series and the VQA103 series radiate red light at a wavelength of 635 nm; the VQA201 and VQA203 radiate green light at 560 nm; and VQA301 and VQA303 radiate yellow light at 590 nm.

The following are the characteristics of diodes in the entire series: luminous intensity, 0.4 to 2.0 mcd; forward voltage, maximum 2.8 V at 20 mA; angle of propagation, 100°. The manufacturer classifies diodes, according to minimal luminous intensity, into five groups: A—0.4 mcd; B—0.6 mcd; C—0.9 mcd; D—1.35 mcd; E—2 mcd. The cutoff current for the diodes is a maximum at 100 μA at a cutoff voltage of 5 V. The cutoff voltage for the diodes may not exceed a maximum of 5 V. The diodes can be subjected to a direct current not to exceed 30 mA

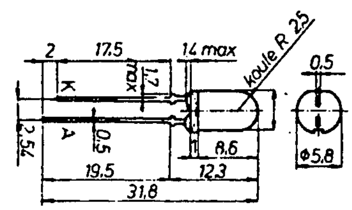


Figure 7. External configuration and principal dimensions of the VQA102 and VQA202 diodes

Key: 1. Lens

Light-Emitting Model VQA102 and VQA202 Diodes

To the LEDs having an average photoemitting surface of 5 mm, the manufacturer adds the VQA102 and VQA202 diodes which radiate red and green light, and have a clear slightly tinted plastic casing. The configuration of the casing, together with the principal dimensions, are shown in Figure 7. The diodes are characterized by a high luminous intensity within the range of 34 to 172 mcd at a forward current of 20 mA. The wavelength of the VQA102 diode's radiaiton is in the range of 630 to 690 nm; that for the VQA202 diodes is within the range of 555 to 570 nm. The propagation angle for the diodes is 20°.

The nominal characteristics of the two diodes are as follows: at a forward current of 10 mA, the maximum DC voltage is 2.6 V. Maximum cutoff current is 100 μA and is measured in the VQA102 diode at a cutoff voltage of 4 V; at a cutoff voltage of 5 V for the VQA202 diode. The manufacturer divides the diodes into groups, in terms of minimum luminous intensity. These groups are: M—34 mcd; N—51 mcd; O—77 mcd; P—116 mcd; R—172 mcd.

Limiting characteristics (applicable within the range of ambient temperatures from -25° C to +55° C) are as follows: forward direct current, maximum 30 mA; peak current is forward, periodic, with a maximum pulse duration of 100 μs and a gating ratio of 1:10 which may not exceed a maximum of 100 mA; direct-current cutoff voltage in the temperature range from -25° C to +85° C for the VQA102 diode may be 4 V (5 V maximum for the VQA202 diode). The range of operating temperatures is -25° C to +85° C; the range of storage temperatures runs from 5° C to 35° C; short-term storage (maximum of 1 month) is possible at temperatures ranging from -50° C to +50° C.

(To be continued)

22161
31

NTIS
ATTN: PROCESS 103
5285 PORT ROYAL RD
SPRINGFIELD, VA

22161

Foreign Broadcast Information Service (FBIS) and Joint Publications Research Service (JPRS) publications contain political, military, economic, environmental, and sociological news, commentary, and other information, as well as scientific and technical data and reports. All information has been obtained from foreign radio and television broadcasts, news agency transmissions, newspapers, books, and periodicals. Items generally are processed from the first or best available sources. It should not be inferred that they have been disseminated only in the medium, in the language, or to the area indicated. Items from foreign language sources are translated; those from English-language sources are transcribed. Except for excluding certain diacritics, FBIS renders personal names and place-names in accordance with the romanization systems approved for U.S. Government publications by the U.S. Board of Geographic Names.

Headlines, editorial reports, and material enclosed in brackets [] are supplied by FBIS/JPRS. Processing indicators such as [Text] or [Excerpts] in the first line of each item indicate how the information was processed from the original. Unfamiliar names rendered phonetically are enclosed in parentheses. Words or names preceded by a question mark and enclosed in parentheses were not clear from the original source but have been supplied as appropriate to the context. Other unattributed parenthetical notes within the body of an item originate with the source. Times within items are as given by the source. Passages in boldface or italics are as published.

SUBSCRIPTION/PROCUREMENT INFORMATION

The FBIS DAILY REPORT contains current news and information and is published Monday through Friday in eight volumes: China, East Europe, Soviet Union, East Asia, Near East & South Asia, Sub-Saharan Africa, Latin America, and West Europe. Supplements to the DAILY REPORTs may also be available periodically and will be distributed to regular DAILY REPORT subscribers. JPRS publications, which include approximately 50 regional, worldwide, and topical reports, generally contain less time-sensitive information and are published periodically.

Current DAILY REPORTs and JPRS publications are listed in *Government Reports Announcements* issued semimonthly by the National Technical Information Service (NTIS), 5285 Port Royal Road, Springfield, Virginia 22161 and the *Monthly Catalog of U.S. Government Publications* issued by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

The public may subscribe to either hardcover or microfiche versions of the DAILY REPORTs and JPRS publications through NTIS at the above address or by calling (703) 487-4630. Subscription rates will be provided by NTIS upon request. Subscriptions are available outside the United States from NTIS or appointed foreign dealers. New subscribers should expect a 30-day delay in receipt of the first issue.

U.S. Government offices may obtain subscriptions to the DAILY REPORTs or JPRS publications (hardcover or microfiche) at no charge through their sponsoring organizations. For additional information or assistance, call FBIS, (202) 338-6735,or write to P.O. Box 2604, Washington, D.C. 20013. Department of Defense consumers are required to submit requests through appropriate command validation channels to DIA, RTS-2C, Washington, D.C. 20301. (Telephone: (202) 373-3771, Autovon: 243-3771.)

Back issues or single copies of the DAILY REPORTs and JPRS publications are not available. Both the DAILY REPORTs and the JPRS publications are on file for public reference at the Library of Congress and at many Federal Depository Libraries. Reference copies may also be seen at many public and university libraries throughout the United States.